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The Outlook

The Bosche "Beat"

JUDGING from the number of letters which have reached us, one or two of which we publish on our Correspondence page this week, there is considerable difference of opinion concerning the possibility of identifying German aircraft from the sound of the engines. Some readers maintain that one can always distinguish a "Jerry"; others deny that this is so.

While we should not like to subscribe to the view that German aircraft can invariably be identified by the peculiar sound of the engines, we do maintain that in the majority of cases the noise of the raider is unmistakable. To us it appears that, superimposed upon the general steady note, there is a slightly higher note of greater intensity. This note is not steady, but recurs with rhythmic regularity at intervals of something like one second, or perhaps a little less.

This effect can be detected in any twin-engined aircraft in which the two engines are not synchronised. The theory has been advanced that German pilots either do not trouble to synchronise their engines, or that they deliberately run them "out of step" in order to confuse the sound locators. Against that hypothesis must be placed the fact that the rhythmic beat never seems to vary from machine to machine, nor from raid to raid. It is always the same. It is scarcely to be supposed that all German pilots would always de-synchronise their engines to exactly the same extent.

One expert has expressed to us the view that the beat is due to a resonance period in the engine crankshafts and V.D.M. airscrews. By way of backing up his argument he recalls that once when travelling in a D.C.3 in America he noted a faint beat of the Wright Cyclone engines. It was found that they were perfectly synchronised, but that the frequency with which the beat was heard was exactly one-hundredth of the engine speed.

In view of the interest of the subject, we should welcome the views and observations of readers. One thing can be definitely stated: the Germans are not using diesels in their military aircraft, so that rules out one explanation. The resonance theory seems rather upset by the recently reported noise of German single-engined aircraft without the "beat."

The Raids on London

HITLER'S last speech was like the ravings of a man three-parts distraught. Those who know him say that opposition always drives him to a pitch of fury which resembles madness. In the Fighter Command of the R.A.F. he has met with an opposition such as he has never met before. Probably he never really expected to get the better of the Royal Navy, and so was the less disappointed when he found that he could not dispute with it the command of the sea. But clearly he had hoped and believed that his large *Luftwaffe* would speedily beat down all resistance, and it shows no sign of being able to do so. Possibly he also believed what he had been told about the impregnable defence which *Flak* fire would set up about the German cities, and especially round the Capital. The Bomber Command has rudely dispelled any illusions of that sort. So Hitler flew into a rage and threatened to drop 100 bombs for every one of ours. Hence the concentrated air attacks on London which began on last Saturday afternoon.

He cannot really believe that bombing London or any other city in Great Britain will bring him victory in the war. If he had held that opinion, he would surely have put it to the proof months ago. It was the Kaiser who told his troops to behave like Huns when he despatched them to China at the time of the Boxer troubles, and ever since the Germans when at war have proved themselves worthy of that name. To slaughter for no military reason evidently gives them pleasure, and so they have lately scattered bombs about the London area with no discernible purpose but to kill civilians.

Dual-purpose Attacks

IN so far as these raids have been mere reprisals, they have been waste of energy, but some directing mind, probably that of Hermann Göring, has contrived to combine a military purpose with the frightfulness.

On Saturday afternoon the raiders attacked aerodromes round London as well as the Capital itself, and so gave our fighter squadrons plenty to do. The bombers which got to London had the sense to make efforts to cripple the Port of London, though they did little harm to it, and mostly wrecked lowly homes in the neighbourhood. The fires they started acted as guides to the night raiders which followed them, and helped their indifferent navigation. To such an extent there was design in the raiding. But when the damage is totalled up, it did not amount to much from the point of view of deciding the war.

For the way in which the people of London of all classes have borne these trials no praise can be too high. Of panic there is not the least sign. The cheerfulness of the British soldier when in straits is well known; his parents and family showed the same humorous philosophy when emerging from shelters to find their homes shattered.

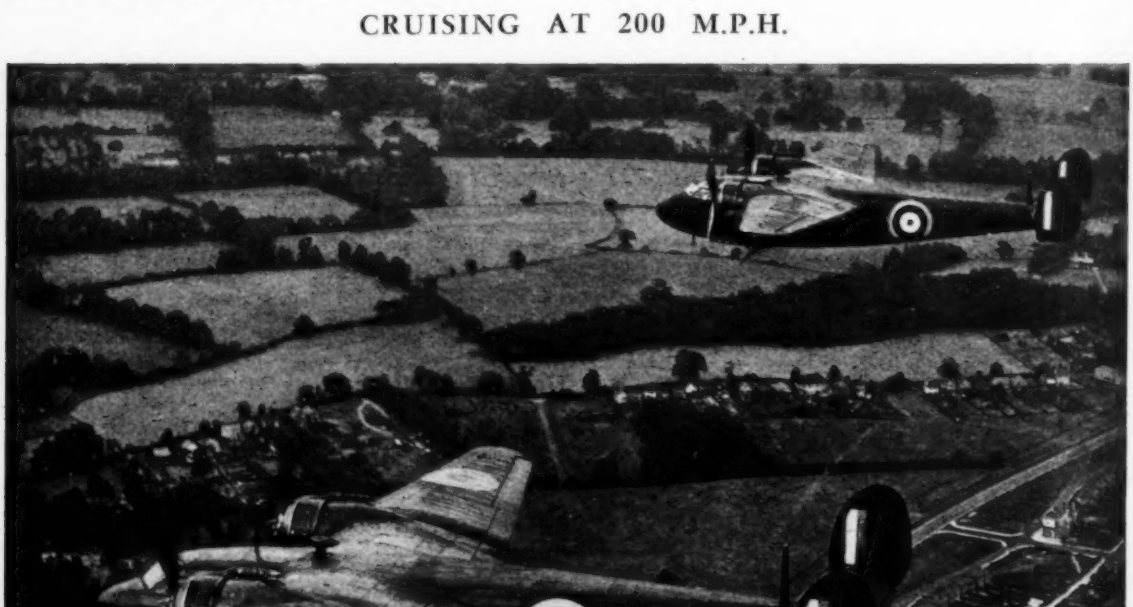
The London A.R.P. workers carried on their duties under bombardment with a courage worthy of their British blood, and the transport workers never faltered in their determination to keep traffic flowing. Such a people will never be beaten to their knees by terrorism; they simply refuse to be terrorised. This latest move of Hitler against Britain has already failed, as perhaps he knew in his heart of hearts that it would fail.

British Aggressive Policy

IN the opinion of the British authorities, reprisals, while being objectionable from all points of view, are a diversion of force from the proper object of winning the war. In so far as the Germans were merely punishing Londoners because the Bomber Command had been so wicked as to bomb factories, power stations and other important targets in the neighbourhood of Berlin, they were merely wasting effort, petrol, and wear and tear of machines, for no useful purpose. The R.A.F. Bomber Command pursues its set purpose of diminishing the war effort of the enemy, and takes first things first. On the whole the nearer targets need the earliest attention, and after showing our long arm and doing some useful demolition at the same time, our bombers turned once more to aerodromes and harbours on the French coast, at Hamburg, and in other appropriate places.

These raids, unseen though they are by the people of London, are in reality part of our system of defending the British Isles. They cut down the number of bombers available for raids on Britain and diminish the supplies of fuel for those raids. They also have an upsetting effect on German plans for invasion of this country, and there is no reason to suppose that those plans have been abandoned. If they are not put into effect before the equinoctial gales set in, there is a great probability that they will perforce have to be postponed until next spring. And every postponement gives time for the Empire's production of aircraft and of pilots to increase, and so bring us nearer to equality with the *Luftwaffe*.

CRUISING AT 200 M.P.H.



"Flight" photograph.

UPON THEIR LAWFUL OCCASIONS: Two D.H. Flamingos in their full war paint set out in company one with the other.

WAR in the AIR

ERASED. A Dornier Flying Pencil burns itself out on the beach.

First Routine Raids : Then Fierce Attacks on London

THE character of the air campaign in the first part of this week was much the same as before. That is to say that the *Luftwaffe* directed most of its day raids against the fighter aerodromes in Kent and Essex, while the night raids were usually heaviest when directed against the Midlands, with occasional excursions to the area of the Bristol Channel and places in the North. The British authorities have never denied that these day raids have done some damage—it was only to be expected that they would. But it would also be vain for Göring to deny that our Fighter Command has the matter well in hand. It suffers some casualities, as every fighting force must do, and some of its aerodromes have been damaged. But each time the Fighter Command, which includes the A.A. guns, breaks up the big formations and usually turns back the greater part of the raid. Some of the large formations which come by day have certainly tried to get at London, but before last Saturday very few machines succeeded in getting to the outskirts of the Capital.

Stronger Fighter Escorts

THE Germans have tried increasing the strength of the fighter escorts which they send with the bombers, but that has not done them much good. At first it did have the effect of distracting the main attentions of our fighters, and for a while the tally showed more Messerschmitts than bombers destroyed ; but our men have revised their tactics, and now the number of bombers destroyed is nearly always much greater than the number shot down out of the escort. Thanks to the superiority of British machines, British flying training, and British fighting spirit, our men actually seem to find it an advantage to attack with smaller numbers, and always the losses of British machines are far below the losses of the enemy. Fighting over his own country, the British pilot who comes down by parachute remains a free man and can fight again, whereas the Germans who come down on British soil are made prisoners.

Incidentally, one young German pilot, aged 18, who came down in England by parachute and hurt himself in landing, asked the nurse who was attending to him where the nearest German troops were. He said that he had been told that battalions of Germans were scattered over Britain who would look after German airmen when they came down. He declined to believe the nurse's denials. Many other prisoners of war have been much surprised at meeting with humane treatment, and at first they often seem to think that a drink offered to them must contain poison.

A good summary of the results of German air action against this country was issued by the Ministry of Home Security at the end of the first year of war. After praising the courage and efficiency of the A.R.P. workers of both sexes, the report goes on to say :—" Just as the spirit and courage of this country remains intact, so does its industrial equipment. After a year of war, and after many weeks of intensive air attack, it is possible to say that the damage caused to property, while occasionally severe locally, is inconsiderable, if the country is taken as a whole. So far as factories and other industrial establishments are concerned, the impairment of the country's war effort has been negligible. Civilian casualties are unavoidable, but it is undoubtedly the case that they would have been far greater had it not been for the provision which has been made for public, industrial, and domestic shelter, notably the steel garden shelters and the brick and concrete shelters which are now being issued in their stead, and which give the same standard of protection. It cannot be assumed that the enemy has yet put forth his full effort. Easy optimism is to be discouraged. But experience under intensive attack warrants high confidence in the capacity of the civil defence organisation to carry out the task for which it was originally created, which was to enable the country to withstand the shock of intensive attack from the air." We may therefore conclude that so far the attempt of the *Luftwaffe* to stop the war effort of this country and to break down the defence of the Fighter Command, preparatory to an invasion, have been a failure.

Hitler's Speech

HERR HITLER made some attempt to explain away this failure in a speech on September 4. He had to ignore the assurances which had been given to the German people that their A.A. defences would make bombing attacks on Germany impossible, and he had also to disregard his prophecies that Britain would be defeated by some particular date. "For three months," he said, "I have

WAR IN THE AIR (CONTINUED)

MIDDLE EAST COMMAND. Air crews of a bomber squadron at their desert aerodrome.

waited for the British to cease the nuisance of nightly and planless bomb throwing. . . . The British will know now that we are now giving our answer night after night. If they attack our cities we will simply erase theirs. We will call a halt to these night pirates. The hour will come when one of us two will break up, and it won't be Nazi Germany. If the British throw two or three thousand pounds of bombs we will unload 150, 180, yes, 200 thousand. . . ." Then he went on to say "I prefer to fight until a definite and final decision is reached. The world will be set free. Once and for all we must do away with the absurd state of affairs that one nation is in a position at its own sweet will to blockade an entire continent. In the future it must be made impossible for a pirate State, at its own sweet will, every now and again, to expose over 450,000,000 people more or less to poverty and misery. I consider it intolerable that a nation of 85,000,000 should be punished in body and soul by another nation whenever it pleases some plutocratic authority."

The last passage with its allusion to "a pirate State" expresses fairly exactly the sentiments of the peoples of the British Empire—to say nothing about the enslaved nations of Europe.

Heavy German Losses

THE failure of the German air invasion is well illustrated by the losses on both sides from day to day. On *Monday, September* 2, the enemy lost 55 machines. Of these 12 were shot down by fire from the ground. Our A.A. gunners are steadily improving with practice, for the only practice which really does them good is firing in actual war conditions. Even the Queen Bee is not such an instructive target as an enemy bomber. The British loss that day was nine fighters, but that meant the loss of only four pilots. It was a very gratifying day for the defence.

Tuesday, September 3, the first day of the second year of the war, was also quite successful, though the losses of the enemy were somewhat less, namely 25 to a British loss of 15 fighters, but only eight of our pilots were lost. On *Wednesday, September* 4, the German losses were again high, namely 54 (two by A.A. fire) while out of the 17 British fighters brought down 12 of the pilots are safe.

On *Thursday, September* 5, the raiders lost 39 machines (two by A.A.) and the defences 20 fighters, but nine pilots survived. On *Friday, September* 6, 34 enemy aircraft were lost, to nine British fighters, with six pilots saved.

We cannot describe in any sort of detail the fighting over Great Britain every day. Let us take Wednesday, September 4. Here is a description of the day's work:—

For an hour an air battle was fought over a hundred miles of English countryside. After losing seven Messerschmitt fighters in their familiar 8 to 9 a.m. attack over Kent and the Thames Estuary, the German Air Force changed their tactics. Shortly before 1 p.m. 200 or more German bombers and fighters came raiding up from the south, crossing the coast all the way from Selsey Bill to the North Foreland. They were making for aerodromes and factories. Spitfires and Hurricanes challenging them from West Sussex to the Thames Estuary destroyed at least thirty-eight. Most outstanding was the rout of the new Messerschmitt Jaguar fighter-bombers. Over the borders of Surrey and Essex, above the quiet fields and copse country of Kent, the Jaguars circled, forming close protective rings against the fury of Spitfire and Hurricane. Twelve of them fell to the bullets of twelve Spitfires of one squadron; and another twelve were the victims of two Hurricane squadrons. The twelve Spitfires first sighted fifteen Jaguars and another fifteen with thirty Dornier 17 bombers further south. Three of the Spitfires tackled the first Jaguars. Nine of them took on the other formation of fifty. They not only destroyed twelve, but helped fighters from another squadron to bring down two more and a Dornier 17 as well. Not one of the twelve Spitfires was hit.

Our fighter squadrons were constantly running into each other's dog-fights. One Hurricane squadron which destroyed six Jaguars saw them circling at bay at 14,000 feet with other Hurricanes and Spitfires darting at their formations. When they had helped in that scrap, they turned to find seventy Jaguars also being attacked. But

MIDDLE EAST MAINTENANCE. Even when engines are cool they are often too hot to handle in Egypt's sun. Note the Vokes air-cleaner in the intake to keep sand out of the works.

WAR IN THE AIR (CONTINUED)

in spite of so many melees, most of the fighter pilots carried away a clear record of what they had done. Here is the list returned by nine Hurricane pilots who claimed six Jaguars:—No. 1 saw smoke belching and the final crash; No. 2 watched his enemy's cockpit burst into flames; No. 3 and No. 4 silenced the rear gunners of their Jaguars; No. 5 made both engines and the fuselage of his enemy catch fire; Nos. 6, 7 and 8 saw their opponents crash; No. 9 left his Jaguar with splinters flying off it.

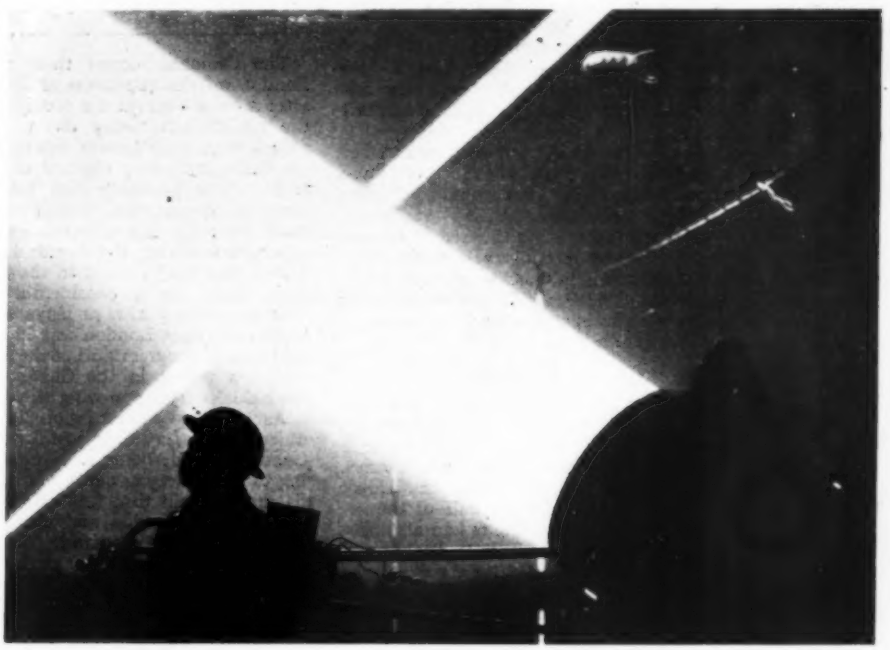
Canadian pilots in their Hurricanes also caught a formation of Jaguars in Sussex. Ten of them, as the Canadian squadron leader said, were "in a defensive circle going crosswise" about 3,000ft. lower. He led the dive attack and the Jaguars did not appear to see the Hurricanes until too late. Their circle was broken up. Two of them and probably a third were destroyed. Others were damaged.

Not all the Spitfires and Hurricanes met the enemy over the Weald country. Some went south to challenge them on the coast.

A Spitfire squadron went even farther south. They broke up a formation of forty Dornier 17 bombers ten miles south of Beachy Head and sent one bomber and two protecting fighters down from 14,000ft. into the sea.

Earlier in the day a Spitfire squadron had fought the enemy the whole way from the Thames Estuary nearly to the French coast. They were too busy, most of the time, to wait and see the result of their attacks, but were sure that at least two of the enemy were destroyed. One of the pilots chased a Messerschmitt 109 to within five miles of the French coast where it caught fire and crashed into the sea. Another of the squadron's pilots attacked four Heinkels and saw smoke coming from one of them.

A Hurricane squadron took on a large formation of Messerschmitts and shot down five. One pilot saw black smoke coming from a Messerschmitt 109 which he had attacked. Then, from a height of more than four miles, the Messerschmitt plunged into the sea just over the Kent coast.



STATIC DEFENCE. A photographic impression of London's searchlights and balloon barrage.

A Fine Piece of Bluff

ON one occasion lately a Hurricane pilot forced down a Me. 109 during a battle over Kent after he had run out of ammunition. The pilot has described how, after using up his ammunition in shooting down two enemy fighters, he saw a third Me. 109 dive past him. "I followed him down to ground level and chased him southwards," he said. "He did not rise above a hundred feet until well south of Maidstone, and then he throttled back. I overtook him and flew alongside him, pointing downwards to the ground. He turned away, so I carried out a dummy quarter attack, breaking away very close to him. After this he landed his Me.109 in a field at about 140 miles per hour. I saw the pilot get out apparently unhurt, and as I circled round him he put his hands above his head, so I waved to him and he waved back. Then I circled low over him and threw him a packet of 20 cigarettes which I had with me. I saw him pick them up, and again he waved. Then I saw what I believed to be members of the Home Guard go into the field and take him prisoner. After that I returned to my base."

Raids over London have become such an ordinary affair that they cannot all be put on record. On the night of Thursday, 5th-Friday, 6th, enemy bombers were over the London area from soon after 9 p.m. until nearly 6 a.m. Londoners are taking the disturbances to regular life very philosophically, and if some look sleepy in the mornings, all are very cheerful. They are learning how to make themselves comfortable in the shelters, and those shelters give excellent protection. One morning's raid resulted in some minor dislocation of communications in the South London area. In another raid a very venerable London church was badly damaged. Some shops have also suffered heavily, but none of these things brings us one iota nearer to acknowledging defeat. As Air Marshal Sir Philip Joubert de la Ferté said in a broadcast, the German people have been enduring really heavy bombing since the middle of May, nearly two months longer than we British have had to put up with it, and we are not going to show ourselves less capable of bearing this burden than the German people.

The Prime Minister made a statement in the House of Commons on Thursday, September 5. Regarding the great air struggle now in progress, Mr. Churchill declared that neither side had put out its full strength, but the Germans had made a very substantial and important effort to gain mastery, and they had certainly put forth a larger proportion of their total air strength than we had found it necessary, up to the present, to employ against them. The need of the enemy to obtain a decision was very great, and if he had the numbers with which we had hitherto credited him he should be able to magnify and multiply his attacks during September. Firm confidence, the Prime Minister declared, was felt by all the responsible officers of the Royal Air Force in our ability to withstand that largely increased scale of attack, and he expressed assurance that the whole nation, taking its example from our airmen, would stand up to the position "grim and gay."

WAR IN THE AIR (CONTINUED)

He then pointed to the difference between the air attack as it actually is and as it was imagined before the war. During August 1,075 civilians had been killed, and rather more had been seriously injured. Sympathy went out to the wounded and bereaved, but no one could pretend that, out of 45,000,000 persons, these losses, even multiplied as they might be two or three times, would be serious compared with the majestic world issues that were at stake. Houses actually damaged beyond repair in August were 800 out of a total of 13,000,000.

Meanwhile our attack on Germany continues with ever-increasing momentum. The raids on Berlin by the Bomber Command are growing almost as monotonous as the German visitations to London, but with the big difference that the British bombers take the greatest pains to find their allotted targets, which are always of military importance, power stations, gas works, as well as aircraft factories.

A new campaign has just been started by the Bomber Command against arms factories which the Germans have been building in their forests. So woods outside Berlin, including the Grünewald Forest, forests in the Hartz Mountains, and an area in the Black Forest to the east of Baden-Baden have been set on fire by incendiary bombs. That we had found something worth bombing was proved by the *Flak* fire which greeted our bombers. As one of the pilots said, "You wouldn't normally expect a lot of guns cracking off at you from the middle of a forest."

Mediterranean Activity

THERE has been some activity in the Mediterranean, in the course of which we read that the Fairey Fulmar, recently chosen as a Fleet Fighter, has been in action, and has, to adopt the language of the Middle Ages, flashed its maiden guns. Mr. Churchill told the House of Commons that our fleet in the eastern half of the sea had been nearly doubled, and reinforcements had also been sent to the fleet in the western section. Both fleets made an extensive sweep recently which lasted for six days. To the disappointment of the crews no contact was made with the Italian fleet. It was under cover of these movements that the reinforcing ships made their way to the eastern Mediterranean, despite the Italian boast that the fortification of the island of Pantelaria in the narrows would prevent the passage of British ships. One plucky Italian machine tried to shadow the eastern fleet, but was shot down by fighters from a carrier. That was on August 31. On the same day our submarines reported enemy ships at sea in the central Mediterranean, and the submarine H.M.S. *Parthian* attacked a force of enemy cruisers and destroyers and obtained two hits with torpedoes. Air reconnaissance reported that the Italian battle fleet was also at sea, but it was 150 miles away from our forces, and when they tried to catch it the Italians made for their base at Taranto at high speed. Meantime in the west of the sea Skuas shot down a shadowing enemy aircraft. Then on September 1 *Swordfish* from the western fleet raided the aerodrome at Cagliari in Sardinia in bad weather.

On September 2 our eastern fleet was attacked by enemy bombers to the south-west of Malta. They did no damage to our ships, while Fulmar and Gladiator fighters of the Fleet Air Arm and the guns of the fleet shot down five of them. Four others were chased almost to Sicily, and probably damaged. These enemy machines were said to be, not Italians, but German Ju.87 dive-bombers. The eastern fleet then steamed towards the Dodecanese Islands, and Swordfish T.S.R. machines attacked the aerodromes at Calato and Maritza. Damage was done to both places, and several enemy aircraft were bombed on the ground at Calato. In addition, eight machines were shot down in the air and six damaged. We lost four machines, but the crews of three were taken prisoners of war. Later on another air attack was made on our ships near the Dodecanese, and one CA 133 and one S 79 were shot down, while at least three others were damaged. No harm was done to our ships.

AIR LOSSES DURING WEEK ENDING SEPT. 7

	German			British	
	By R.A.F.	By A.A.	Total	Aircraft	Pilots
Aug. 31 ...	73	15	88	37	11
Sept. 1 ...	25	0	25	15	6
" 2 ...	43	12	55	20	8
" 3 ...	25	0	25	15	7
" 4 ...	52	2	54	17	5
" 5 ...	37	2	39	20	11
" 6 ...	34	0	34	9	3
" 7 ...	75	28	103	22	13
Totals ...	364	59	423	155	64

The Germans staged their first concentrated raid on London on the afternoon of *Saturday, September 7*, and after a brief interval the onslaught was continued through the night until nearly dawn. They asserted that this attack was a deliberate retaliation for the British raids on Berlin, and they claimed that it was made by 500 aircraft. Most probably they under-stated the number for propaganda purposes. There were not more than 700, and most likely about 600, German machines over Great Britain as a whole during the day and the following night. The attack was not confined to the London area, but included aerodromes for a considerable distance beyond. The Thames estuary always plays a large part in such raids, and South-East London was heavily attacked. While the raid was in progress during the afternoon the enemy maintained a patrol in the Channel, probably to watch for lame ducks trying to wing their way home.

As has been stated before in these columns, the main object of the *Luftwaffe* just now is to wear out the Fighter Command and, being still superior in numbers, it is willing to face heavy casualties in order to achieve its purpose. Saturday's raid thus fulfilled the double object of damaging parts of London and also causing plenty of activity to the Fighter Command. That day the Germans certainly had to pay a heavy price, for they lost 103 machines, of which the A.A. guns shot down 28. The gunners are now getting their eyes in finely, and in the week from August 30 to September 5 they shot down no fewer than 61 enemy aircraft. The R.A.F. lost 22 fighters on the Saturday, but nine of the pilots survived.

Indiscriminate Bombing

THE afternoon raid started fires, many in the docks area, which served as a guide to the night bombers, which at first seemed to aim their bombs in the direction of targets of more or less military importance, but as the night went on they began to drop them broadcast over many parts of London where there was nothing of the sort. It was obviously the well-known Hunnish delight in slaughtering civilians. During the day and night raids they killed 400 people and injured some 1,400. Among the buildings hit were a railway station and a hospital. Some patients and nurses were killed in the hospital.

Sunday, September 8, during the daylight, did not see acute activity. In the morning there was one raid over London between 12.30 and 1.20 p.m., in the course of which 11 enemy machines were brought down. But the night again saw fierce bombing. It started at 8 p.m. and went on until 5.30 a.m., when the last raiders flew homewards before the dawn broke. The night bombers came in singly, and appeared to circle round the London area in considerable numbers. Rather low clouds reflected the fires which they started and gave a lurid appearance to the whole of the capital, while the searchlights pursued the course of the raiders and the shells of the anti-aircraft guns burst round them.

The courage of the people of London was fine. Everybody who had work to do carried on with it, while large numbers who were not obliged to be busy took refuge in the shelters. The firemen and A.R.P. workers in particular behaved with calm courage, while the many families whose homes were destroyed, mostly poor folks of the working classes, accepted the misfortune with true British calm.

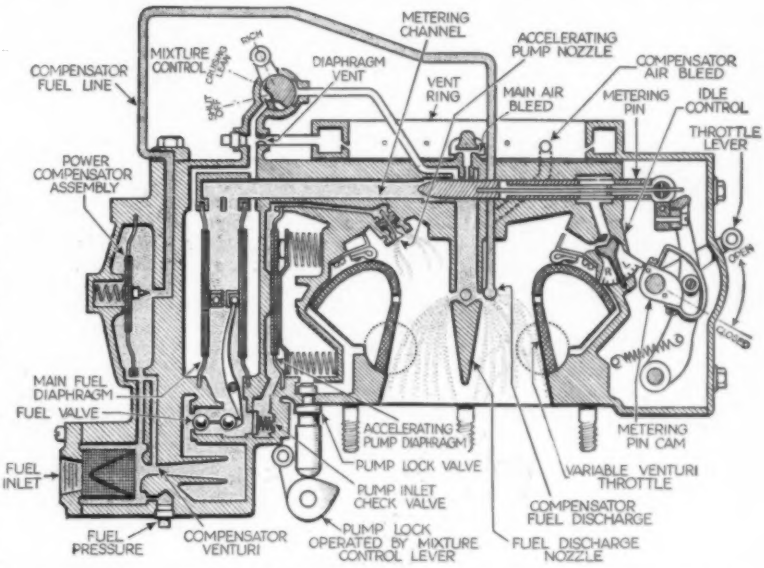
THE CECO CARBURETTOR

Non - icing Diaphragm Type : Venturi Throttle : Inverted Operation

THE Ceco aircraft carburettor, manufactured by the Chandler-Evans Corporation, of Detroit, Michigan, was designed by M. E. Chandler and W. B. Groves and is an improvement on the Chandler-Groves carburettor which has been in use for some years.

The following description comes from an article in *The Intava World*, and is published by courtesy of that paper.

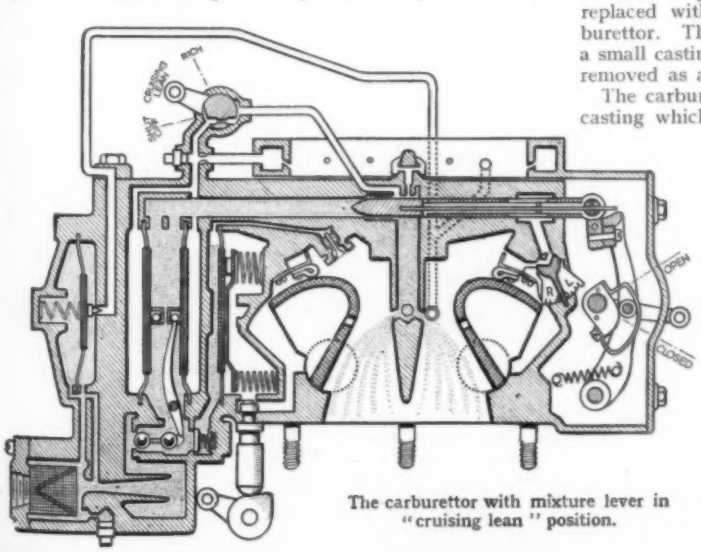
The Ceco carburettor has a single air passage into which fuel is furnished from a fuel supply chamber, the means of introducing the fuel into the air passage being similar to that employed by carburettors of other designs; that is, by a controlled pressure difference which is produced by reduction in the cross-sectional area of the air passage opening. The similarity ends here in that in the Ceco carburettor the fuel supply float mechanism is replaced by a diaphragm mechanism, and the control of the air passage is accomplished by means of a variable venturi instead of a fixed venturi and conventional butterfly valve.



Functioning of the Ceco carburettor during take-off, with power compensator and accelerating pump both in action. The absence of obstructions on which ice may deposit should be noticed.

The arrangement of the fuel-discharge nozzle and venturi throttles is such that the carburettor is said to be inherently free of ordinary icing troubles. Research work on the icing of carburettors has shown that the problem is largely to prevent the deposition of ice on obstructions in the air passage. The fuel in vaporising causes a reduction of temperature of the air, the fuel and the carburettor, and so causes any water vapour present to freeze. Both theory and experiment indicate that the ice particles tend to travel in a straight line and so will be most likely to build up a deposit on surfaces directly in the air stream. This consideration has been borne in mind in the design of the Ceco carburettor.

Also, the means of metering fuel and the throttle used in this carburettor provide partial compensation for changes in altitude. However, to obtain more exact altitude adjustment and increased economy under favourable operating conditions, a manual control for "leaning-out" the fuel-air mixture is provided.



The carburettor with mixture lever in "cruising lean" position.

General Construction

The throttles are made in the shape of modified cylindrical sectors having the discharge nozzle bolted between them and forming a streamlined venturi-shaped passage for any degree of opening. The throttles are fitted into the main body with a small clearance at either end and are sealed against leakage by means of a leather brush which lightly bears on the top of the cylindrical surface. A gear on each throttle and on the throttle-lever shaft drives them in synchronism. Both the throttles and the control shaft are mounted on oilless bushings.

Fastened to the left side of the carburettor as a unit is the main diaphragm mechanism which can be removed and replaced without disturbing the other parts of the carburettor. The mixture control is a self-controlled unit in a small casting fastened to the rear face. This can also be removed as a unit.

The carburettor is vented through a hollow rectangular casting which lines up with the air entrance and is provided with several small holes around the inside surface. This serves to maintain an average of the pressures existing at the carburettor entrance. From this vent ring drilled passages lead to the space outside the two main fuel diaphragms.

The diaphragm mechanism consists of two similar diaphragms placed side by side and forming a chamber for fuel between them. At its centre each diaphragm is flexibly connected to a lever, the other end of which contacts the end of a fuel valve. This fuel valve is a ball-ended plunger sliding in a guide which also forms the seat. From the fuel pump, fuel under pressure enters through this valve and fills the chamber between the diaphragms. These diaphragms are caused to bulge outwardly by the weight of the fuel, thus forcing the valves against their seats by means of the levers. When

THE CECO CARBURETTOR (CONTINUED)

the quantity of fuel in the chamber between the diaphragms reaches a certain weight, it exerts sufficient force on the diaphragms to close the fuel valves against the fuel pressure.

At the top of the fuel chamber is the outlet. The fuel discharge nozzle suction is carried back to this point and tends to draw the diaphragms together, which permits the fuel valves to open and pass more fuel. Accordingly, at all times with the engine running, the diaphragm chamber is completely filled with fuel, which eliminates trouble due to splashing—and the resultant interruption of fuel flow—during violent manœuvres. Owing to the symmetrical design of the diaphragm section the carburettor will operate inverted as well as right way up.

To control the fuel-air ratio of the carburetter, the main metering channel (which is attached to the outlet of the main diaphragm mechanism) is provided with a restriction and a tapered needle for metering.

Thus, when the throttle is opened to enlarge the air passage, the fuel passage opening is correspondingly enlarged to provide the proper flow of fuel. The profile of the cam is designed to give an approximate constant mixture ratio for all openings of the throttle above the idling range. At the centre of the main metering channel an air bleed is provided to stabilise the flow of fuel.

The idling adjustment is obtained by an additional air bleed in the form of an adjustable valve. This valve is operated only when the throttles are nearly closed (engine idling) as it bleeds air through a passage in the centre of the metering needle which shuts off when the needle is moved out of the seat approximately $\frac{1}{16}$ inch. For engine speeds above about 1,000 r.p.m. the idling adjustment is not affected.

Power Compensator

To provide means of enriching the mixture as engine output is increased towards the maximum, an automatic enriching device is built into the carburettor. In the fuel inlet a venturi is provided. When fuel flows through this venturi the pressure at the throat is less than the pressure at the entrance. The greater the flow of fuel through this venturi the greater the pressure difference between the entrance of the venturi and the throat. This pressure difference is used to operate a needle valve which is spring-loaded. When the flow of fuel is increased to the point where the venturi pressure difference equals the initial tension on the spring, the needle valve starts to open. Further increase in the flow through the venturi increases the lift of the needle. This valve, entirely automatic in operation, furnishes an additional quantity of fuel directly from the fuel entrance through the external tube located on the rear side of the carburetter to the compensator discharge nozzle.

Above a certain power output the mixture becomes automatically enriched regardless of the size of throttle opening or the altitude. Below this output the mixture is maintained at its normal value for cruising power, also regardless of throttle opening.

Mixture Control

The Ceco carburettor, with its combination of diaphragm mechanism, metering system, and venturi throttle mechanism, compensates partially for altitude without using any auxiliary mixture-control device.

However, a manual mixture control is furnished to permit "leaning out," to get more exact adjustment at altitude and better economy when cruising.

The actual effect of the mixture control valve is to supply to the air space outside the diaphragms a percentage of the same suction existing at the metering needle. This serves to reduce the suction available for drawing fuel out of the diaphragm chamber and results in a decreased pressure drop across the fuel metering restriction, which gives a decreased fuel flow and a resultant leaner mixture.

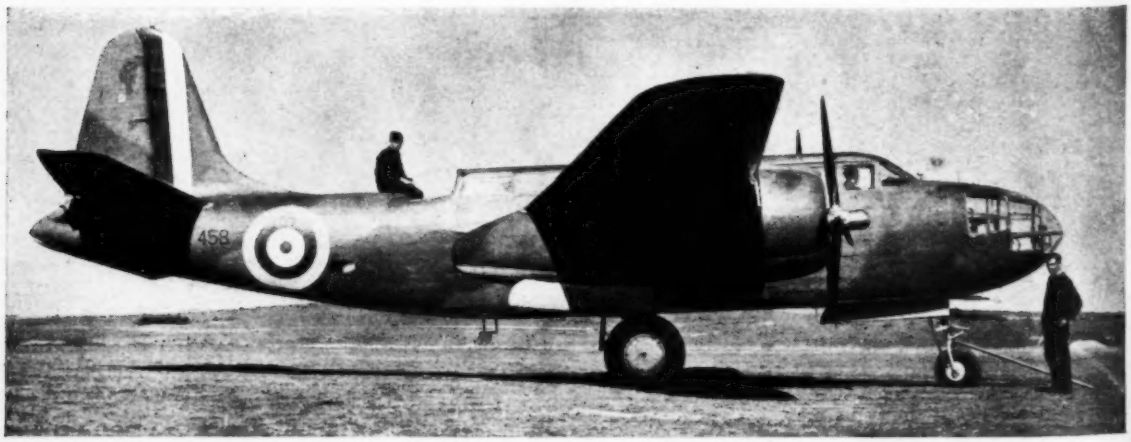
A further function of the mixture control is to shut off the fuel flow, thus preventing the engine from after-firing when it is stopped. This is done by moving the mixture control its full travel beyond the "cruising lean" stop.

Accelerating Pump and Primer

To provide rapid and positive engine acceleration it is necessary to provide an additional amount of fuel when the throttles are opened quickly. For this purpose a diaphragm type of accelerating pump, operated by vacuum, is provided. The action of this pump is automatic and there is no mechanical linkage between the pump and throttles.

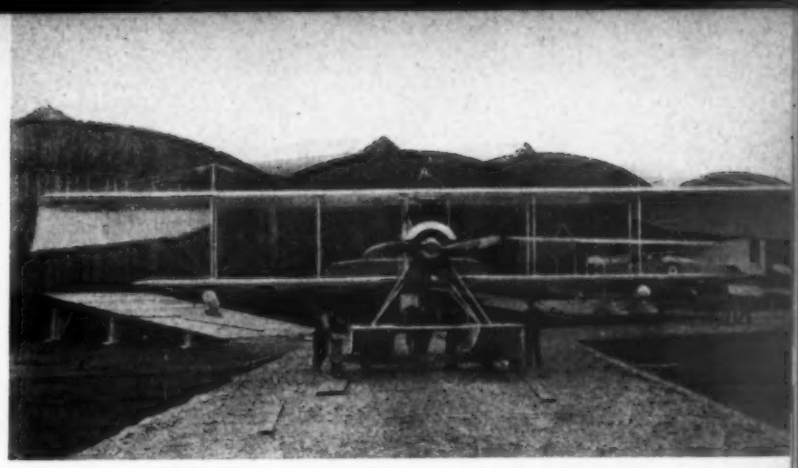
Primer

The primer is an electrically operated device to permit delivery of fuel from the fuel inlet of the carburetter to the engine for starting purposes. An electric solenoid raises a needle when the primer switch button is turned on, and by operating the hand wobble-pump, fuel under pressure is admitted to the engine without passing through the carburettor. When the switch is off a spring returns the needle to its seat. In case of electrical failure it is possible to operate the primer by hand.



THIS CHANGING WORLD. That the famous "Tea Party" is forgotten is proved by America supplying us with aircraft, and by our naming this Douglas DB-7 the *Boston*.

38 TYPES IN 25 YEARS



The Short seaplane with 200 h.p. Canton Unne engine.

"Westlands" Complete a Quarter of a Century : Remarkable Versatility in Range of Designs

AIRCRAFT manufacture was begun at Yeovil in August of 1915, a section of the well-known Petters oil engine works having been equipped for building seaplanes for the Admiralty. From this branch of Petters, Ltd., grew first the Westland Aircraft Works and, more recently, Westland Aircraft, Ltd. This is thus a very suitable opportunity for reviewing the work done by Westlands during a period which has, surprisingly enough, now reached a quarter of a century. The period is one which has seen the development of the aeroplane from the relatively crude but very serviceable "stick-and-string" days to the highly efficient but very complicated aeroplane of the present day.

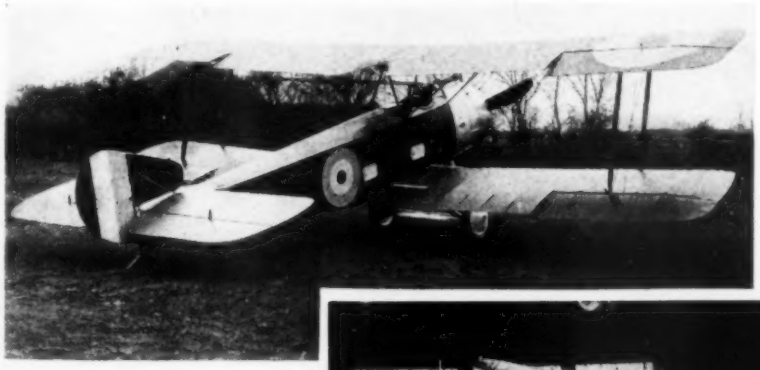
Throughout these twenty-five years, or, at any rate, through more than twenty of them, Westlands have followed a progressive policy; never afraid to launch out on experiments which promised to carry the evolution of the aeroplane one step farther. Not all the types produced have been unqualified successes. That was not to be expected when large departures from orthodox features were made frequently. But from each of its less successful types the firm has learned a tremendous amount, and the experience has been applied to the next design. Put in figures, the Yeovil firm has, during its twenty-five years of existence, built something like 38 types of aircraft. They were not all of proprietary design, a beginning having to be made by building machines designed by other companies. But not many years elapsed before a design office was established, and from then onwards scarcely a year went by without at least one new type of Westland design seeing the light of day. During the slump years Westlands had, on more than one occasion, to earn their bread-and-butter by building aeroplanes for other firms. But even in the worst of times they continued with their original designs.

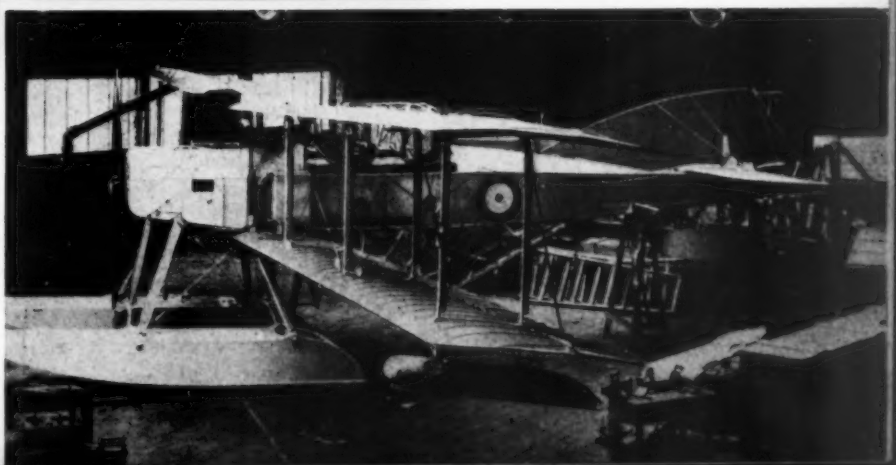
It all dates back to April, 1915, when there was a serious shortage of war materials of all sorts, and when the directors of Petters, Ltd., decided to place the whole of their manufacturing resources at the disposal of the Government. Many departments were informed, but it was the Admiralty which took immediate action by asking the firm to undertake aircraft manufacture. Admiralty inspectors visited the works, and arrangements were made for supplying the firm with drawings. At the same time, Mr. R. A. Bruce was released to enable him to resign his commission and to take charge of the works and the manufacture. How great was the influence of Mr. R. A. Bruce on subsequent Westland history those of us who have followed the fortunes of the firm know full well. He was to remain technical chief until his retirement a few years ago, but even now his advice is available.

The First Delivery

But to return to our history. The first Westland-built aircraft was delivered in January, 1916, which is a creditable achievement considering that manufacture did not begin until the previous August. The first two contracts were for seaplanes, first the Short "Two-two-five" and then the Short with 200 h.p. Canton Unne engine. These first two contracts were followed by others from the Admiralty, including Sopwith "One-and-a-half-strutters" and De Havilland D.H.4s.

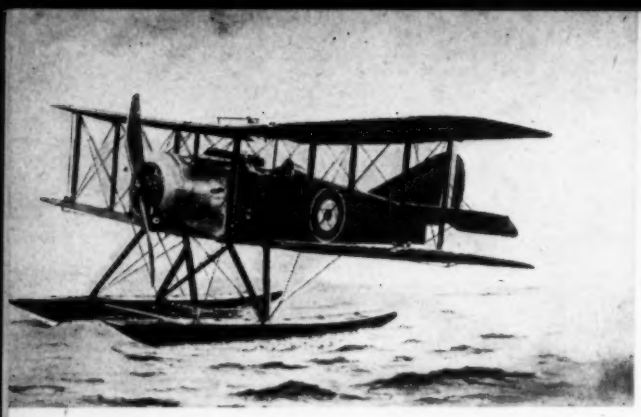
In the case of the Short 225 Sunbeam seaplanes complete drawings and schedules were furnished by Shorts, and very complete technical information was given. This was essential in view of the fact that all skilled aircraft workers had been absorbed by existing firms,

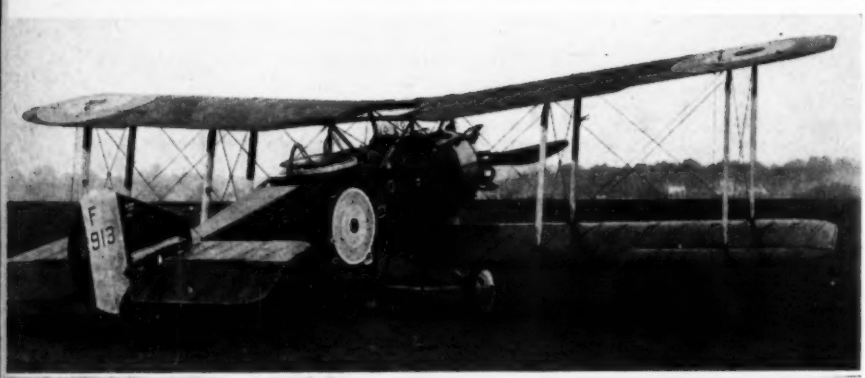




Among machines of other firms' design built by Westlands was the Sopwith "One-and-a-half-strutter" shown above. The Short "Two-two-five" (right) was the first aircraft to be constructed at Yeovil. It had a 225 h.p. Sunbeam engine.

38 TYPES IN 25 YEA





and it was necessary to rely upon the services of ordinary joiners, cabinet makers, fitters in local garages, with the nucleus of men from Petters, Ltd., oil engine works. During the first three months only one or two of the employees had had any previous experience with aircraft.

For the production of the Short 200 Canton Unne seaplanes the drawings in a complete state did not exist, and considerable co-operation between the Westland technical staff and that of Shorts was needed in order to complete such drawings as were available. As the engine is not now well known, it may be recalled that the Canton Unne was a Swiss water-cooled radial built under licence in this country.

The drawings furnished for the Sopwith and earlier De Havilland machines were complete, and the special modifications introduced by the Westland Aircraft Works were inconsiderable; they related chiefly to questions of armament, etc.

When, however, the Liberty engine began to be delivered to this country, and it was expected that the production would henceforth be in large quantities, the Air Board found it a matter of pressing importance that the D.H.9 machines should be modified so as to enable this engine to be installed in these machines. This led to the Air Board arranging that the Westland Aircraft Works should become the parent firm for the D.H.9A class of machines, owing to the fact that the Aircraft Manufacturing Company (who were turning out the prototype machine engined with a Rolls engine) were preoccupied with, and the whole of their staff engaged on, the production drawings of the D.H.10 class of bombing machine. This entailed the closest possible co-operation and co-ordination between the firm's designing staffs and the technical staffs at the Aircraft Manufacturing Company and Technical Departments of the Air Board.

The results of their efforts were successful, and they were the first to produce a machine to accommodate the Liberty engine. A large number of other constructors were able to engage on the production of the D.H.9A type, and large quantities were thus produced, built from drawings issued from the Westland Aircraft Works.

In addition to the machines originally designed by other firms, or developments arising out of them, the Westland Aircraft Works turned out, during the war period, several types of their own design. The N16 and N17 types of fighting scout seaplanes were specially designed for the Admiralty. They were provided with folding wings primarily for shipboard use. These machines did not come into

The types shown on the left are, reading from the top, the N.17 scout seaplane, the Westland Wagtail, the Westland Weasel (both with A.B.C. engine), the D.H.4 with Rolls-Royce Falcon and the D.H.9A with Liberty engine.

(CONTINUED)

Considerable numbers of the Vickers Vimy, of the type which crossed the Atlantic in 1919, were built by Westlands.

production owing to a change of policy which led to the substitution of fast types of aeroplanes for shipboard use in place of the float machines.

Two interesting land machines of high performance were introduced—the Westland Wagtail and the Westland Weasel. Unfortunately, certain troubles were experienced with the A.B.C. Wasp and the A.B.C. Dragonfly (the engines used in these machines), which prevented them being used in the 1918 campaign. The decision not to proceed with these types of engines also rendered the machines themselves obsolete.

The total number of machines constructed by Westlands during the war period was 808, made up as follows:—

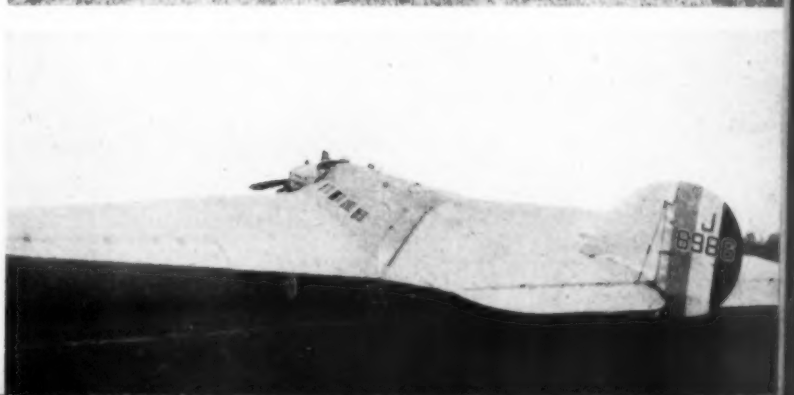
Short seaplanes	32	
Westland experimental seaplanes	2	
	—	34
Aeroplanes:		
Sopwith 1½ strutter	75	
D.H.4	150	
D.H.9	150	
D.H.9A	390	
	—	765
Total production aeroplanes		765
Experimental aeroplanes:		
Westland Wagtail	5	
Westland Weasel	4	
Total experimental aeroplanes	—	9
Grand total		808

Immediately after the war the firm paid attention to the design of civil machines for mail and passenger accommodation.

The first commercial machine completed its trial flights in the early summer of 1919. This was a passenger or mail carrier with a total all-up weight of 3,300 lb., in which a 225 b.h.p. Rolls-Royce Falcon engine was installed. It was built to accommodate three passengers and pilot; or mails to the equivalent of 540 lb. could be carried in lieu of the passengers.

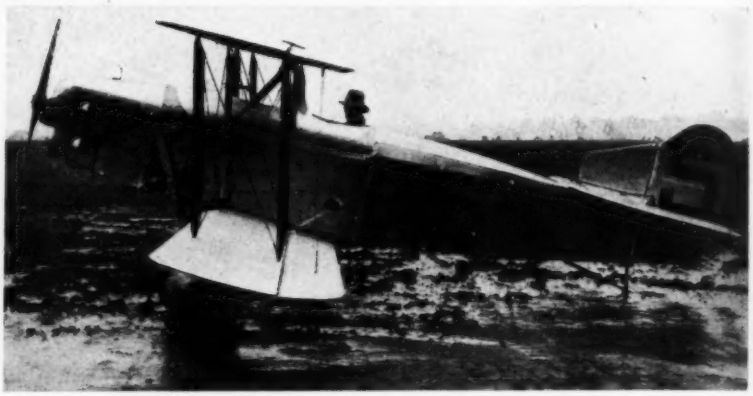
Six of these machines in all were built, but at that time the virtues of the enclosed cabin type were not recognised in the way they are to-day. The machines were very convenient, and even before 1920 the possibility of dictating and typing letters in the air was proved to be thoroughly feasible and practicable in these machines.

A larger experimental type of enclosed cabin machine was designed and built in 1920. This had a capacity of six passengers or 1,000 lb. of mail. It took part in the Air



Pictures on the right show, from top to bottom, the "Limousine," in which the pilot sat with his head in the open and his legs in the cabin; the Westland Six, which won the Martlesham competition; the Westland Walrus and the Westland Dreadnought or Woyewodsky.

38 TYPES IN 25 YEARS (CONTINUED)



The first Widgeon (above) had an unusual planform and a Blackburne Thrush engine. The Woodpigeon (right) had a 30 h.p. Bristol Cherub engine.

Ministry Civil Aviation Competition held the same year at Martlesham Heath, and was awarded, in competition with a number of other machines of that class, the first prize of £7,500. After the competition the machine was sold and sent out to Newfoundland. There it did very good work spotting for the sealing fleets, working off the coast under extremely difficult conditions.

Unlike many other aircraft works which came into existence during the war, the Westland Aircraft Works had the rare advantage of a situation which provided ample ground space for successful workshop enlargements on a well-thought-out plan. A piece of ground of 80 acres in extent was acquired, and gradually developed into a high-class aerodrome suitable for all types of machines. At the end of the war a large erecting shop was completed to admit of the construction of machines up to a height of 30ft. by 150ft. span; or, by special arrangements, a span of 180ft. could be provided for. A first-class system of heating throughout all the buildings was adopted, and ventilation was carefully attended to, a matter of even greater importance in those days than now, inasmuch as wood formed the chief material for construction.

During the months immediately following the war 25 Vimy Bomber machines, which were in progress at the time of the Armistice, were completed and delivered to the Air Ministry.

In the next few succeeding years work was difficult to obtain, and the establishment had to be considerably cut down. A portion of the aircraft works was converted for oil engine manufacture, leaving a well-arranged and compact combination of workshops capable of undertaking any Government or civil contracts likely to mature.

The first post-war contract for the Government, other than experimental work, orders for spares, etc., was obtained in 1920 and was for 36 Westland Walrus machines. This machine was designed in conjunction with the authorities at the R.A.E. for the purpose of fleet spotting. To a large extent it followed the practice of the D.H.9A. Special flotation gear was designed to enable these machines to alight on the water, and the undercarriage wheels were detachable.

During the years 1921 to 1926 the works were very largely engaged on the reconditioning and the rebuilding of D.H.9A biplanes, and on the supply of spare parts to the very large number of squadrons equipped with this machine. But in these years the following experimental machines were also built:—

Three Westland Yeovil Bombers; two Twin-engined Westland Westbury machines carrying a specially large-calibre gun; and the Westland Woodpigeon and Widgeon light planes.

In 1927 the first Wapiti was designed, built and submitted for competitive trials at Martlesham Heath. As a result of this competition it was selected for general-purpose use and to replace the D.H.9A. The competition was a particularly strenuous one, and the machine was selected from among eight competing aircraft.

The first Wapiti production order for 25 machines was obtained in the autumn of 1927. They were composite machines with wooden wings and wooden and metal fuselages. This was followed by an order for one all-metal Wapiti, and from that

The two pictures on the left show the Yeovil and the Westland Westbury respectively. The latter was the first twin-engined machine of Westland design.

38 TYPES IN 25 YEARS (CONTINUED)

The Westland Witch (above) was a high-altitude, single-engined day bomber of all-metal construction. The Wapiti (left) became widely used, and also saw service as a floatplane. It was also fitted with ski undercarriage.

time onwards over 500 machines of this type were supplied from the Westland Works, 472 for the British Air Ministry, 38 for Australia, 4 for South Africa, and one for China. In addition to this, a licence to construct the machines in South Africa was negotiated, and the South African Air Force built a number of machines of this type.

In addition to the machines mentioned, Wapitis were extensively used in India and the Middle East, and all Auxiliary Squadrons were armed with this type of aircraft. Four machines were supplied through the British Air Ministry to the King of the Hedjaz. At one time there were probably more Westland Wapitis in service with the Air Forces of this country and her Dominions than any other single type of aeroplane.

The Wapiti underwent various modifications in the course of time. The latest type produced was designed to include Army Co-operation in its sphere of utility, as well as its use as a bombing, reconnaissance, and general-purpose machine. This type was fitted with brakes, swivelling tail wheel, and a longer fuselage than standard. The latter was designed to give a wider range of c.g. This was necessitated by the varying conditions of Army Co-Operation loading.

The Wapiti was also very successfully used as a seaplane, and during the spring of 1931 a machine of this type, fitted with an Armstrong Siddeley Panther engine, was demonstrated as a land and seaplane in Argentina and Uruguay with great success.

The Lighter Side

Reverting to the construction of light aeroplanes, the Westland Widgeon was developed from 1927 to 1929 and proved a popular machine. Many of these aircraft were sold, and there were a number in service in widely scattered places such as Canada, New Guinea, Australia, Natal, etc. The machine was modified to take various power units such as the Gipsy and the Cirrus-Hermes engines, and a metal fuselage was developed. However, in the spring of 1930 it was decided to discontinue the manufacture of this type, as the pressure on the works of the intensive Wapiti production, and the introduction of the Westland IV, rendered the manufacture of the Widgeon out of the question. This decision to cease manufacture of this type was also influenced by the consideration that the light aeroplane market was already well catered for by other manufacturers.

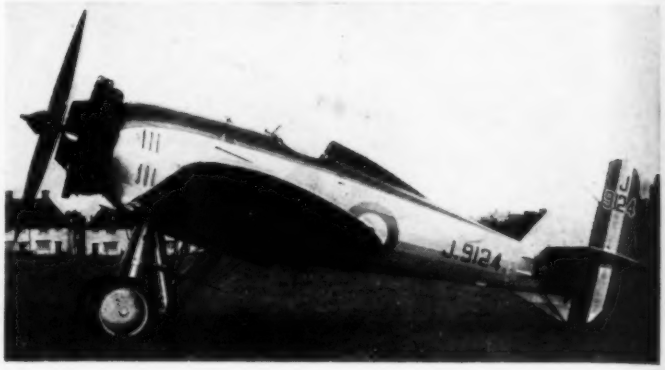
In 1928 the Westland Aircraft Works produced two further types of experimental machines to Air Ministry contract, the Witch and the Wizard. The former was a high-wing day bomber, designed to work at high altitudes and with a very good performance. The Wizard was a single-seater fighter high-wing type with a Rolls-Royce F.XI.S. engine. This was at the time probably the only monoplane single-seater fighter in the Royal Air Force, and it enjoyed the reputation of being the fastest single-seater fighter of its period.

Both the Witch and the Wizard were of all-metal construction. The machines, however, were not put into production, as they were purely of an experimental nature. A second model of the Wizard was also produced with an open centre section in order to

In the Wizard (above) one sees the first signs of approaching cleanness of aerodynamic design in fighters.

After the Lympne trials, the Westland Widgeon III (right) was introduced as a private-owner type. It had Gipsy and Cirrus-Hermes engines.

38 TYPES IN 25 YEARS (CONTINUED)



The Westland IV small commercial aeroplane was a three-engined type. In the interceptor fighter on the right the low-wing arrangement was first adopted, but the undercarriage did not retract.

improve the view from the pilot's cockpit.

Early in 1929 a new type of civil aeroplane was designed and produced, the Westland IV. This machine was a high-wing three-engined cabin monoplane, designed to take five passengers, with baggage, and one pilot. Cirrus III engines were installed and, in a later model, Cirrus-Hermes, but after extensive experiment it was decided to discontinue the use of these power units, and the machine was marketed in the spring of 1930, when it had been redesigned to take the Armstrong Siddeley Genet Major engines. It was named the Westland Wessex.

During the experimental work of 1929 a very considerable amount of experience was gained, and soon after the production of the Wessex four of these aircraft were purchased by Sabena, the well-known Belgian Air Lines.

In the spring of 1931 the Armstrong Siddeley seven-cylinder 140 h.p. Genet Major engine was introduced. The Wessex was tried out with these engines and proved a great success. Consequently the Wessex was offered in two models, the Standard and High Performance, fitted with the five-cylinder and the seven-cylinder Genet Majors respectively.

In the early summer of 1931 Imperial Airways, Limited—who had been operating one of the original Westland IV six-seaters fitted with Cirrus-Hermes engines—arranged for their machine to be converted to a High-Performance Wessex with seven-cylinder Genet Major engines. This was done, and the machine was operated with great satisfaction by Imperial Airways, Limited, who used it for private hire and charter work.

During the summer of 1931 H.R.H. the Prince of Wales honoured the firm by making use of the demonstration High-Performance model Wessex when he was in the South of France on holiday.

The Westland low-wing Interceptor Fighter was produced during 1929-30 and subjected to flying trials. This was a further experimental machine undertaken to Air Ministry order. The machine was a low-wing, wire-braced, single-seater monoplane, fitted with a Bristol Mercury IIA engine and designed for interceptor work. A very high performance at altitude was obtained. It now seems to have needed only a retractable undercarriage to make it modern.

The Pterodactyls

In 1926 the firm entered into negotiations with Captain G. T. R. Hill, the inventor of the Hill Pterodactyl tailless-type monoplane, and Captain Hill joined the staff in order to develop this tailless type. At the same time, the firm acquired the sole rights of the existing patents in connection with this aircraft.

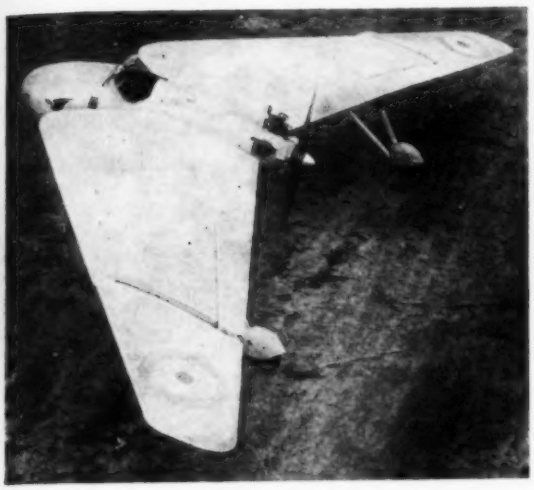
It was recognised that a programme of experimental research of some duration was required in order to master successfully the problems of applying the principles of the tailless-type aircraft to machines of heavier loading and higher power-weight ratios. In this experimental research the Westland Works had the full co-operation and assistance of the Air Ministry, which was interested to the extent of placing orders for successive models to assist in research. These were tested out in due course by R.A.F. pilots, and the public had the opportunity of seeing them on various occasions at the R.A.F. displays at Hendon.

The latest civil Pterodactyl, the Mark IV, appeared before the public at the R.A.F. Display at Hendon in the summer of 1931, and was later in the hands of the Royal Aircraft Establishment at Farnborough for intensive experimental work. In this aircraft the fore-and-aft lateral control was obtained by means of controller flaps at the wing tips, and the machine was steered by the use of single-acting swept-back wing tip rudders, which also acted as air brakes when brought into operation simultaneously.

The Mark IV, a three-seater of the enclosed-cabin type, was fitted with an inverted Gipsy III engine and wheel brakes were installed. Furthermore, this model featured a gear for sweeping the wings forward or backward on the ground or in flight, thus trimming the aeroplane for wide variations in load at all speeds. The Mark V was a military type.

The so-called C.O.W. fighter has its fixed gun mounted in an unusual attitude. The P.V.3 (left) was purchased by the Everest Expedition.

Unorthodoxy characterised the types shown here. The pictures on the right represent the Westland-Lepere Autogiro, the Hill Pterodactyl Mark Ia, the Mark IV and the Mark V. Below is the Pterodactyl Mark Ib.



In addition to production types and the experimental machines above mentioned, the Westland works have continually undertaken experimental work on their own account with the full approval and support of the Air Ministry.

In the early part of 1932 was introduced a machine in which all the experience gained with the Westland Wapiti, and the improvements and modifications that had been made thereto from time to time, were incorporated. This aircraft, known in its early stages as the Westland P.V.6, was very similar to the later types of Wapiti in external appearance, but owing to careful detail work it had a very considerably higher performance.

This machine was designed to fulfil all the functions under the general-purpose category, which had been met by the Wapiti in the past, but to bring the performance more in line with modern requirements. Especially was this so as regards speed. At the same time the designers were determined to sacrifice none of the advantages which had been so outstanding in the case of the Wapiti, particularly with regard to high military load. This machine, after a test of Martlesham Heath Experimental Station, received the approval of the Air Ministry and was christened the "Wallace"; at the beginning of March, 1933, production of this aircraft for the R.A.F. was undertaken.

Practically coincident with the production of the Wallace machine for the R.A.F., the Westland Aircraft Works came very strongly into the public eye in the early days of 1933 as suppliers of the aircraft used by the successful Mount Everest Flight Expedition, which had been financially supported by Lady Houston. The Expedition Committee purchased a standard Westland Wallace machine and the P.V.3.

The P.V.3 was an aircraft which had been designed experimentally by Westlands to meet an Air Ministry Specification for a torpedo-carrying and deck-landing machine with folding wings. The Specification was later dropped for tactical reasons. The performance of the P.V.3 when fitted with the same engines as those supplied to the Wallace—namely, the Bristol "Pegasus" unit—was almost identical with that of the Wallace, and, of course, one of the great advantages was the very large amount of accommodation in the fuselage for the varied duties of the observer and pilot.

These two machines then underwent certain modifications as a result of many conferences between the mem-

The Westland general-purpose biplane on the left was a private venture and developed into the Wallace.

38 TYPES IN 25 YEARS (CONTINUED)

bers of the Expedition and the Westland Design Staff. All military fittings that would tend to increase weight were removed. The open rear gunner's cockpits were covered over, converting the rear compartment into a closed cabin, and special arrangements were made to carry an ample oxygen supply and to fit various types of camera. Brakes were removed to save weight, and by arrangement with the Bristol Aeroplane Co., Ltd., a fully supercharged version of the Pegasus—the S.3—was installed in each machine.

During the test flights of these aircraft at Yeovil during the January of 1933 both aircraft very easily passed the tests which involved, amongst other matters, the attainment of a very high altitude. Actually, the P.V.3 with full load equipment and crew (as for the actual Everest flight) attained a height of over 35,000 feet, and the Wallace in the same condition made over 34,000 feet on the test flights at Yeovil, thus establishing what is actually an unofficial world's altitude record for a two-seater aircraft with such a load.

The machines were thereafter dismantled, packed and despatched to Karachi, where they were reassembled, flown across India to Purnea (the base of the Expedition north of Darjeeling), and on April 3, 1933, the flight over the summit of Mount Everest was successfully accomplished by both machines, as all the world now knows. Thereafter the Westland Wallace was returned to England, repurchased by the Air Ministry, reconverted to its normal military state and handed over in due course as a production machine. The Houston-Westland (as the P.V.3 is known) was purchased by the Air Ministry and passed back to Westlands for experimental work with various new types of power unit.

During 1934 the Westland works were engaged on further production of Wallace aircraft, and, in addition, carried out experimental work with interesting new types.

The first of these was a high-wing monoplane, general-purpose aircraft, designed to replace the Wallace and to carry in addition a torpedo. Tests with this machine were highly satisfactory and an unexceptionally good performance was realised. Most unfortunately, however, the prototype was wrecked whilst under test at Martlesham, owing to an unpredictable chain of circumstances. Valuable information was, however, obtained from the tests and this information was incorporated in future machines.

A breakaway from conventional methods with engine installation was made in the F.7/30 single-seater day and night fighter. In this machine the pilot was placed ahead of the biplane wings, and the engine was installed behind the pilot and under the centre-section, driving the tractor airscrew through a shaft. A most valuable range of vision was thereby secured for the pilot without in any way affecting the handling qualities of the machine, and the experimental engine installation was highly successful. The specification for this type was not proceeded with, and the prototype was not put into production. It is interesting to recall that the Air Ministry has now ordered the American Bell Airacobra, which has this engine arrangement.

Versatility of design is shown by these three types. The G.4/34 was a private venture known as the P.V.7. The Wessex was a development of the Westland IV but with Genet-Major engines. The F.7/30 was a fighter with the Rolls-Royce engine behind the pilot, an arrangement recently re-introduced in the Bell Airacobra.

Reorganisation

During the year fundamental changes occurred in the administration of the firm, and Mr. R. A. Bruce, who had been Managing Director since the inception of the Aircraft Works in 1915, retired, though he was remained as a consultant to the new board. Sir Ernest Petter became chairman and managing director to the Aircraft Works, assisted by Capt. A. S. Keep and Mr. W. E. W. Petter, who was also elected to the board of Petters, Limited, as technical director to the Aircraft Department. Captain Hill, who had been responsible for the design and development of the Pterodactyl, resigned his position in order to take up an appointment as Professor of Engineering at London University. All patents and rights in connection with the tailless aeroplane remained vested with Petters, Limited.

During 1935 the firm were engaged

38 TYPES IN 25 YEARS (CONTINUED)

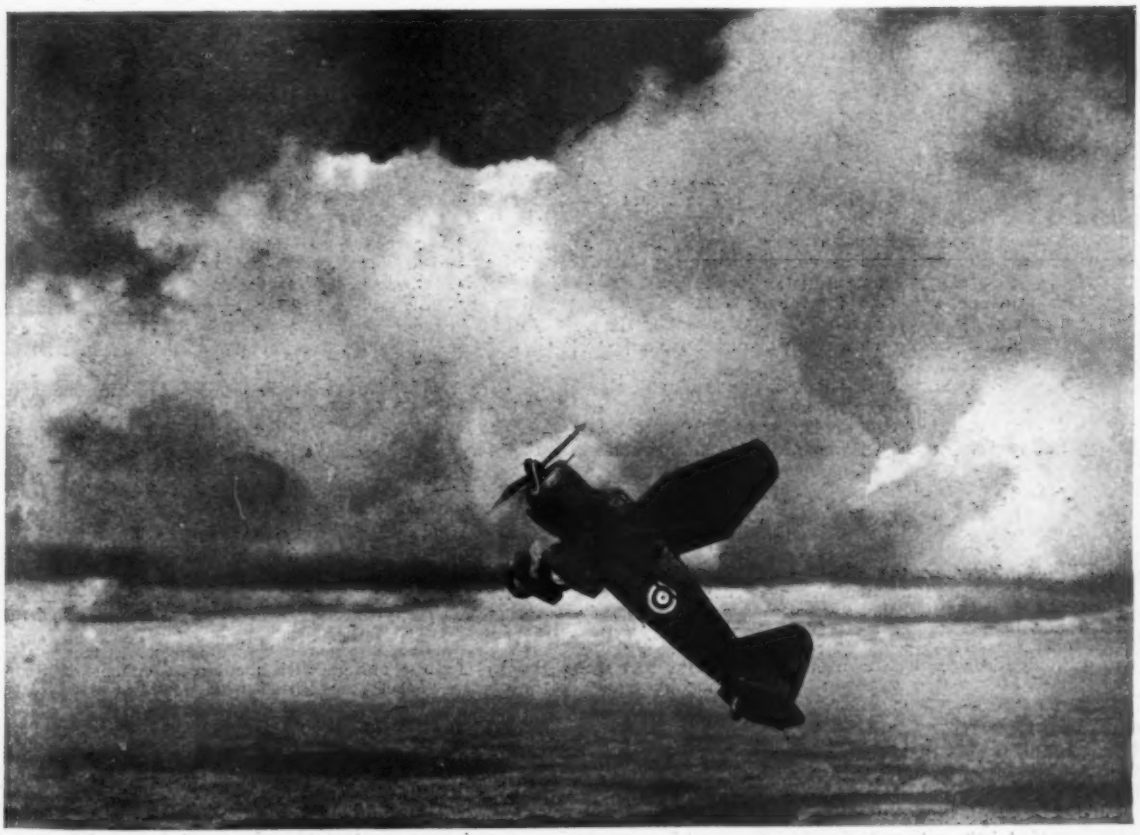
The Hawker Hector with Napier engine was among machines built by Westlands.

on the construction of a large number of Wallace for the Air Ministry's new Production Programme. Experimental work on the machine which was to become the "Lysander" was started, and work on two types of Autogiro, commenced the previous year, was completed, as was also that on the Pterodactyl series. The Autogiros were purely experimental machines, one built for the Cierva Autogiro Co. to the Air Ministry's order, and the other constructed in order to investigate the possibilities of the construction of the rotating wing machine for the private owner.

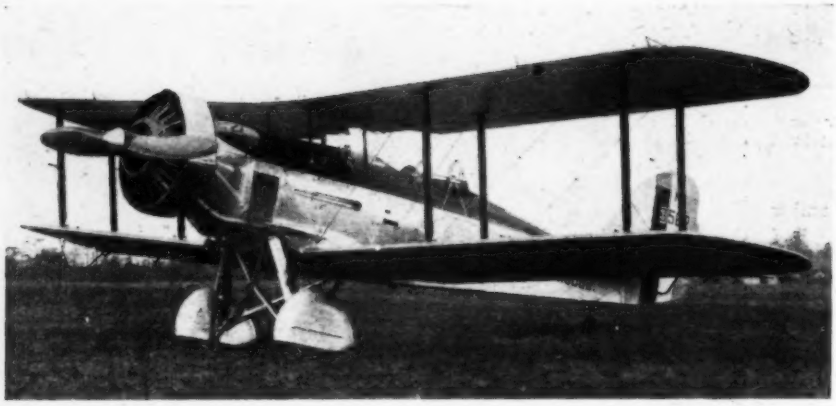
An important event in the career of the Aircraft Works was its severance from Petters, Limited, and its reorganisation as a separate company—Westland Aircraft, Ltd. This company was formed on July 4, 1935. The directors of the new company were:—Sir Ernest W. Petter, M.I.Mech.E., Chairman and Joint Managing Director; Captain P. D. Acland, Joint Managing Director; Air Vice-Marshal N. D. K. MacEwen, C.B., C.M.G., D.S.O., R.A.F. (Retd.); Mr. W. E. W. Petter, B.A., Technical Director. The General Manager was Captain A. S. Keep, M.C., B.Sc.

Production of Wallace aircraft continued during 1936, and in June the first prototype of the Army co-operation monoplane to Specification A.39/34, which subsequently became the "Lysander," began its flight trials. It was followed later in the year by a second similar prototype. It is interesting to note that both prototypes are still going strong, the first—having been converted to the Mk. II prototype by changing to Perseus XII engine—is now at the works for further experimental purposes; the second is at present in India, being tried out in the squadrons there. Only twelve months had elapsed between the placing of the prototype order and beginning of flying trials. Two months later the first production order was received.

Following on the completion of the Wallace contracts, production began on an order for a number of Hawker Hector Army co-operation aircraft with Napier "Dagger" engines.



The Lysander shows its paces. With its interconnected slots and flaps acting automatically, pilots can do things which would send ordinary aircraft into a spin.



38 TYPES IN 25 YEARS (CONCLUDED)

Developed from the P.V.6 prototype, the Wallace (left) may be said to be a descendant of the Wapiti, but with a better performance.

The Lysander, Mark II, army co-operation monoplane (below) is the latest Westland type of which illustrations may be published.

Throughout 1937 the "Hectors" were turned out and preparations were made for putting the "Lysander" into production, together with further development work on the "Lysander" prototypes.

Early in the year the first production "Lysanders" began to come along. These were the Mk. I type with Bristol Mercury XII engines. After a short time, however, the engine installation was changed to one incorporating the Perseus XII engine, and this type has since been in quantity production at an ever-increasing rate. It was used extensively in the French campaign.

At the end of the production of the Mk. I type a batch of these were manufactured for the Egyptian Air Force. In addition, arrangements to build a number of Lysander II aircraft under licence were made by the National Steel Car Corporation of Canada.

In July, 1938, important changes were brought about in the constitution of the company when Thos. Firth and John Brown, Ltd., of Clydebank, the famous steel and shipbuilding firm, obtained a controlling interest and a new board of directors was appointed. At the end of 1938 further changes in the constitution of the company took place, and the Associated Electrical Industries group of companies obtained an interest in Westland Aircraft, Ltd.

Meanwhile, the original parent firm of Petters, Ltd., were amalgamated with the Brush Electrical Co., Ltd., of Loughborough, and the premises occupied by Petters, Ltd., adjacent to the aircraft works, were acquired by the Westland Company and vacated by Petters when they transferred their works to Loughborough.

The present board of directors is made up as follows:—Lord Aberconway, C.B.E. (chairman); Sir Holbery Mensforth, K.C.B., C.B.E.; Mr. S. W. Rawson (all of Thos. Firth and John Brown); Sir Felix J. C. Pole; Mr. W. C. Lusk; Mr. C. F. Spencer (all of Associated Electrical Industries); Air Vice-Marshal N. D. K. MacEwen, C.B., C.M.G., D.S.O.; Mr. Alan P. Good; Mr. Eric Mensforth, M.A. (managing director); Mr. W. E. W. Petter, B.A., A.F.R.Ae.S. (technical director); Mr. J. Fearn (works director) (all three of Westland Aircraft, Ltd.).

INCREASING LOAD FACTOR

THE load factor on the airlines in the United States is increasing. This important commercial quantity, which is able to make the difference and frequently does, between profit and loss in an air transport concern, has risen from 54.8 to 60.0 per cent. when May, 1939, is compared with May, 1940. This is a very significant change and shows that U.S. air transport is rapidly getting to a highly satisfactory financial state as well as having already attained to operational efficiency.

A load factor of 100 per cent. would correspond to having every seat occupied by a passenger over the whole length of the journey. This is obviously unattainable practically owing to the variability of human wants, but just what is the maximum factor which can be reached has so far not been established. It is not, of course, a constant figure but will vary for different airlines according to their character. The best figure for the month in question was reached by American Airlines with 70.7 per cent., and this company also flew the greatest number of revenue passenger miles, over 27 million. United, with the next biggest total of nearly 21 million rev. pass. miles, had the next highest factor with 62.0.

A study of the list reveals that the high load factors were reached by the airlines with the largest volume of traffic. Except for two very small lines with factors of under 30 per cent., the lowest factor was 40.6 and the average as mentioned previously for the whole U.S. system was 60.0 per cent.

American Airlines' figure of 70 per cent. may be something like the maximum attainable for a network of routes, although on some particularly favourable route with few stops it may be possible to go higher than this. Though it cannot be stated definitely since loading figures are not published elsewhere, it is thought likely that this is the first time that the factor of 70 per cent. has been reached anywhere in the world, and *Flight* extends its congratulations to American Airlines.

AIR BLOCKADE—IX

Target Selection is All Important : The Special Case of the Textile Industry

By
CAPT. NORMAN MACMILLAN, M.C., A.F.C.

GREATER Berlin and the territory surrounding it offer a concentrated target within which lies an assorted variety of objectives whose elimination by means of air bombardment will weaken many facets of German military strength ; but it cannot destroy any one of them. That must be remembered in considering the Royal Air Force attacks against the capital city of the Reich and its environs.

The list of military objectives in and around that urban area which I gave in *Flight* last week showed the variety from which the Air Staff can choose targets of the greatest immediate importance. When selecting them, the general scheme of air blockade must be borne in mind, so that the factories and depots which are smashed within the Berlin target area will fall into the general plan for the progressive weakening of the whole military power of Germany by means of the combined sea and air blockade. For it is by the scientific application of that combination of sea and air blockade that Britain (and all the forces which are encompassed within that word) will defeat the power of the enemy. First, by the limitation of his ability to continue the pace of his aggression, then by the shrinkage of his power to hold what he has obtained, and thirdly by producing the conditions necessary for his successful overthrow by force to bring about his defeat.

The Berlin Area

The importance of the Berlin target area lies in the existence of factories which simply *must* be attacked from the air if any scheme of blockade is to be effective. To ignore these targets would vitiate the value of the blockade. I admit that it is unfortunate that there are workers' dwellings in close proximity to many of the factories, and it is therefore probable that their dwellings will suffer damage, either by near-misses or by blast and splinters. But it is impossible, when fighting a brutal and ruthless foe whose incapacity for pity is no new phenomenon of the present decade, to exercise humanitarian principles to the point of courting one's own defeat.

In a series of articles which appeared in *Flight* in 1937, I described visits I made to the Daimler-Benz aero engine factory in Berlin, and to the airframe factory of Henschel at Schönefeld on the fringe of Berlin. The engine factory stands in an area where there are many dwelling houses ; the airframe factory rises among fields. Both targets are important. There can be no exemption from attack which is valid in the military sense. But there would be reason to select the most expert bomber crews to attack a factory sited in the proximity of dwelling houses ; first because it is a more difficult target to identify and hit, and secondly because the hitting of that target is more important than the unintended victimisation of the civilian population as a result of near-misses.

The great factory of Siemens and Halske and Siemens-Schuckert at Siemenstadt (Siemenstown) outside Berlin is entirely different from any target within the Berlin area proper. It is a city in miniature. In the year when Hitler came to power (1933) the works had a capacity for 135,000 hands ; but work was then slack and only 45,000 hands were employed. The Nazi rearmament policy quickly filled up the factory with work.

In appearance Siemenstadt is rather like a medieval town. It stands alone. Its own private railway line runs to it. A large proportion of the workers live in houses belonging to the company and situated on the "estate." The factory buildings are immense structures, far enough from the dwelling house part of the property to be easily susceptible to air bombardment without laying the living quarters open to undue risk of severe damage. But vast canteens are situated within the main buildings, and there the majority of the workers have their principal meals. If the canteens (or the huge electric kitchens, or the electric power plant) are damaged, the productive capacity of the factory will be immobilised ; for the property of marching on its stomach is not a military prerogative by any means.

Much the same feeding problem applies to the Henschel factory, for its workers travel to it from the city. They are fed in the factory canteens, and if the canteens are damaged the output will certainly be affected. This factory, was, however, laid out to offset

AIR BLOCKADE (CONTINUED)

the effects of air attack so far as possible. Its buildings, widely separated, are staggered. Each is a self-contained unit, with its own power, light, water, underground shelter and canteen. All engineering drawings and documents are stored underground below the main administrative building. As an organisation it must be less sensitive to air attack than either of the others I have mentioned here. Its weakest link probably is the line of communication for its workers and stores. That means the roads and railway interconnecting Schönefeld and Berlin. They should be attacked in addition to the factory.

Indeed, this matter of vital local communications for factories ought to be gone into most thoroughly in its relationship to air blockade, for not only will it assist to disorganise a bombed factory, but it will make the repair and reorganisation of the damaged factory more difficult. Moreover, without unduly imperilling the lives of German civilian workers, its paralysing effect upon their normal transport will impress upon them the potency of British air power.

Essential Industries

The problem of the effective air blockade of Germany must be solved by a process of target selection. It is improbable that any one industry can be completely smashed; or if it were smashed improvisation would be impossible. So it is desirable to choose a number of essential industries (and commodities) upon which to concentrate attacks with the object of reducing each to its minimum value to the enemy, and thus taxing his ingenuity to the uttermost to find substitutes, to organise alternative industrial sites and sources of supply, and to create new lines of communication.

With some industries it will not be necessary to attack all branches of the industry. Concentration upon one branch may be enough to throw out the whole organisation. To advise the Air Staff it is necessary for the British Intelligence Service to consult experts in different branches of industry who can assist them to analyse each industry so that British air power can be applied in the most effective and economical manner. For it is by this method that the quickest results will be obtained and the war brought to the speediest possible conclusion. Every bomber sent to attack a redundant industrial target means that victory is one flight farther off.

German "Opposite Numbers"

I have dealt with a concentrated, composite target area in the Berlin district. Consideration of this target area might produce the inclination to over-evaluate the industrial work of the district because of its association with Berlin. Personally, I am all for bombing Berlin as a city every time London as a city is bombed. I would go farther, and draw a list of German cities as opposite numbers to a list of British cities and announce openly that I considered those German cities to be the counter against which air action would be taken in reprisal for the bombing of British cities. For that is the only kind of language which the German military despot knows and understands. But I would not take reprisals now at the expense of lowering the efficiency of an air blockade of Germany. There is time for reprisals when our air strength grows. Let the Germans know that. So the bombing of industrial targets in and around Berlin must be linked up with the bombing of other targets of a similar character throughout the Greater Reich, and perhaps—a regrettable necessity—in the territories now occupied by Germany also.

There can be no doubt that the German military machine will utilise every source of power from which it can squeeze strength (witness Roumania). And in those unhappy lands where the Prussian jackboot freely strides to-day, the economic and industrial life of the community will be harnessed to the Prussian war chariot. So it is necessary to take into the consideration of air blockade all sites of industry which line up with Germany's requirements, and to cripple them by means of air attack, even though those attacks are directed against industrial plants upon the territory of our Allies. (Hitherto such attacks have been launched against targets of a direct military nature.)

For, as Britain's air strength grows, German organising power will be called in to devise protection by dispersion, and that dispersion will not take into account the right of any save the present ruling caste in Germany.

Whereas, until now, most of the targets singled out by the Royal Air Force in France, Belgium, Holland, Denmark and Norway have been aerodromes, harbours, oil storage depots, it may become necessary, in future, to launch attacks against all manner of industrial plants in such of these countries as possess them. It would be wise, I think, to make this clear now, before the necessity has arisen, for it would be kinder to warn the people who are really on our side that we may have to do this if the German organisation employs their industrial capacity to feed the German war machine. For no one in Britain has the slightest belief that Germany will not make such use of the industrial plant of the countries she has overrun, and that she will force the workers of these countries to slave to her need for war production.

The Textile Industry

There is perhaps no better instance of a dispersed target than the textile industry, about which a correspondent has written to me. Here is what he says:

"The bombing of Germany's textile industry (which I had advocated in an earlier article) would certainly be useful. The west German mills are vulnerable, since they are set mainly in the towns of Aachen, M. Gladbach, Rheydt, Düren and Krefeld, but the southern mills in the Stuttgart region are very scattered, lying in the various beautiful valleys of the district.

"The (German) textile industry has one advantage, from a national point of view, in that it is built up of many factories of medium size, rather than in a few enormous plants. The greatest weakness in Germany is the wool combing industry, which supplies the combed tops for worsted spinning—five very large mills (Hanover, Bremen, Delmenhorst, Leipzig and Mylau in the Vogtland) supply perhaps 80 per cent. or more of the total population. However, the Germans now have all the large combing plants in the North of France and one or two in Belgium at their disposal.

"Perhaps the best textile targets would be the great factories making the synthetic fibres, of which there are perhaps eight or ten, mainly in Southern Germany. Apart from the large size of these plants, their contents would be very inflammable."

Now, clothing is almost as essential to the well-being of an army, and to the efficiency of the civilian workers, as food. And in this respect, compared with Britain, Germany is at a disadvantage for her climate borders

AIR BLOCKADE (CONTINUED)

on the Continental and is therefore hotter than ours in summer and colder than ours in winter. Moreover, German troops now have to be maintained in Norway where the cold is more intense than in their own homelands. These men need warm clothing. So do those in Poland. I have known the ice a metre thick on the Vistula at Warsaw, and I have arrived there in midwinter with the snow falling during a partial thaw which cut through one more sharply than a hard, dry frost. I pity those who have to live in such climates with insufficient wool and fur. Add to such conditions a scarcity of food, and discontent will simmer as the hardships of living bring misery.

Uniforms

But it is upon the German troops that one would desire the full penalty of insufficient clothing to fall. Unfortunately, the civilian population must also suffer, in the occupied countries even before the Reich, for requisitioning will undoubtedly be carried to extremes in the endeavour to maintain the efficiency of the German Army to the last. But, throughout, the army must wear uniform. There is the direct line of attack to take against their comfort. Bomb those factories which are engaged upon the manufacture of army clothing for the German army. Examine thoroughly all sources of wool supply that Germany possesses. Detail, too, all synthetic processes employed by the German textile trade, and plot their factory location. Find out how far the French and Belgian factories are now working for their temporary overlords, and if need be place them into the general scheme.

Attack lines of communication for timber, both in harbours and along railway and canal systems. And set out a list of centres wherein German military stores carry supplies of clothing materials for the army. Then simultaneously launch the combined blockade attack. Let loose against all the targets whence Germany draws her clothing and maintain it until the damage done is irreparable except at the expenditure of much time and effort. Then complete the work by direct attacks upon barracks and troop concentrations, so that the immediate stores held by them will be destroyed too, and cause demands to be made upon the already damaged factories and central stores.

The real strength of an army lies in its man-power and in its man-spirit. Weapons are essential. But to use them men are more essential still. Dispirited men cannot make the most of the weapons they possess. And there are no more potent causes of the weakening of the powers of human resistance than hunger and cold. Hitherto the sea blockade has been mainly directed to secure the arbitrament of hunger. It is not so well suited to produce the companion impoverisher of spirit. But air blockade can make this defect of sea blockade good. Air blockade can destroy where sea blockade can only withhold. And in the ersatz world in which we now live, and in which Germany has specialised, the power of withholding is a less vigorous weapon than it was. But by the systematic application of air blockade to stop "the holes in the dykes," the power of blockade can be made stronger than ever before, despite the fact that the Third Reich is not ringed about by hostile armies as was the Germany of the last of the Kaisers.

This target of the textile industry is the antithesis of the Berlin target area. In Germany alone it straddles all defence zones. It falls into the occupied territories outside Germany, and some of the unoccupied territory too. It is a wide target but one well worth the systematic attention of our bombers before the autumn is any farther advanced.

T.C.A. and the WAR

SOME forty employees of the Trans-Canada Air Lines have already entered one or other of the fighting forces. Of these, ten or twelve have become pilots, and one of these has been killed on active service. "No restrictions on T.C.A. pilots or any other personnel have been made," stated Mr. D. B. Colyer, vice-president, in a recent interview. "They are at liberty to join the Royal Canadian Air Force if they so desire, and, as a matter of fact, a number of our pilots have joined up already. In addition to these, two pilots, Captain W. G. Coulson and Captain Bruce Middleton, who were on the R.A.F. reserve list, were called up immediately on the outbreak of war. Captain Coulson was reported killed in the middle of August."

An Order-in-Council passed by the Canadian Government last September exempted all reserve officers of the R.C.A.F. who were with the T.C.A. "Otherwise our whole organisation would have been disrupted," explained Mr. Colyer, "because one-third of our personnel would have been called up, making it impossible to carry on. But all our pilots volunteered their services in their spare time for instruction."

Although this offer still stands, no T.C.A. pilots have actually been used for instruction purposes under the Commonwealth Air Training Plan, firstly because it has been found impossible yet to fit their services in when they are available only for part time, and partly because they have been fulfilling a more important role.

For some months, all the spare time of pilots in Toronto, Winnipeg and Vancouver has been taken up with trips to the United States, from whence they fly to Canada aircraft purchased there. They have also done considerable flying of aircraft from the west of Canada to the east and vice versa, when they were needed at other training schools. Mr. Colyer estimated that hundreds of thousands of miles have been flown in the latter service alone.

At the request of the Munitions and Supply Board, which acts as the equipment and service organisation for the air force, T.C.A. have quadrupled their plant in Winnipeg for the repair and checking of delicate instruments used in flying. An overhaul shop was recently opened in Toronto to meet the need for periodic checking and overhaul of instruments.

Mr. Romeo Vachon, assistant superintendent of the eastern division of T.C.A., was lent to the Munitions and Supply Board three months ago, to assist in the servicing and maintenance of Air Force planes. He may undertake this work for the duration.

Eventually, the R.C.A.F. hopes to have all its own hangar space, but for the last few months, while construction has been going on, T.C.A. hangars in Moncton, Winnipeg and other points has been made available for Air Force needs.

"Our hangars at Winnipeg are half full of military aircraft," Mr. Colyer said. "We have in the past co-operated and will always co-operate in any way that we are asked."

Perhaps the greater contribution that T.C.A. had made to the war effort, he added, had been an indirect one of providing rapid transportation so that contractors, military officials and airmail service could span the Dominion every day.

A YEAR of AIR WARFARE

A Survey of the Activities of the R.A.F. During the First Year of the War

From the Air Ministry News Service

DURING the winter 1939-1940 it almost seemed as if the war had not begun. But the Royal Air Force, during this period of apparent inactivity, was, in fact, doing two very important jobs. The first was the continuous dawn-to-dusk escort provided for convoys approaching the British Isles to discharge their cargoes at ports on various points on our coasts. This was a task carried out with monotonous regularity, and its success was best shown by the amazingly few ships which were ever attacked while in convoy, and the fact that our sea-borne trade carried on throughout the winter practically unmolested.

The other job (which came in for a good deal of criticism at the time) was the leaflet raids carried out by forces of heavy bombers, which, during the winter, visited cities as far away as Prague and Vienna. Whatever the value of the leaflets may have been, our pilots on these raids acquired an invaluable knowledge of Germany and an ability to navigate over the country successfully in the worst weathers—a knowledge which has since borne fruit in the widespread and accurate bombing operations carried out during the last few months.

With the coming of spring, air activities, which, apart from the two winter tasks above mentioned, had been sporadic and unimportant, suddenly flared up with the German surprise attack on Norway. With the advantages gained from her treacherous initiative, Germany occupied most of the important Norwegian aerodromes, and British aircraft, in an attempt to harass the enemy's sea-borne communications and troop concentrations, were working at enormous disadvantage three or four hundred miles away from their home bases. The Norwegian campaign has come in for much criticism, but it provided the R.A.F. with a chance to show the initiative and ability of its fighting pilots. The record of the Gladiators which, from improvised aerodromes, succeeded in holding off the attacks of the German Air Force and ultimately in making the successful evacuation of Bodo and Narvik possible, is a stirring record of what a few determined young men can do under hazardous conditions and against heavy odds. The story finished on a tragic note with the sinking of the aircraft-carrier *Glorious* and most of those who had taken part in the Norwegian campaign, immediately after the final evacuation had been successfully completed.

The Lesson of Norway

The power and generalship behind the German armed forces was not fully realised until the success of the Norwegian campaign became apparent, and something like an armour of invincibility appeared to shield the German army as it made its tremendous onslaught through the Low Countries against France. Daily events grew more threatening to the Allies, and the British public turned to the only good news—which came from the R.A.F. It was known before the war that the Germans had a great superiority in the air. To counteract this to some extent, the R.A.F. had sent to the help of the French Army and Air Force more squadrons of aircraft than had been promised during the winter, and, as events grew worse, the R.A.F. more than doubled this assistance, to the extent of seriously weakening its own home defences. Nevertheless, with a long front to protect, the Allied Air Forces were unequal to their enemies, and, during the retreat, British fighter pilots found themselves fighting from dawn till dusk, carrying out six and seven sorties a day, always against odds.

The result of these operations, apart from their help in slowing up the German advance, was encouraging to the R.A.F. for another reason. It proved the superiority both of British aircraft and British pilots. If there had ever been any doubt in the public mind as to the efficiency of the R.A.F., the show put up in France dispelled it, and the week of air battles over Dunkirk, during the evacuation of the B.E.F., settled it once and for all. It became axiomatic that if parity in striking power and ultimately superiority could be obtained, the war in the air was won.

Here is the moment to reflect on the wide development which had been going on, both since the outbreak of war and for some time previous to it, in the setting up of aircraft training schemes in the Dominions.

Organisations in Canada, South Africa and Australia had been getting under way, and by June, 1940, the first contingents of Colonial and Colonial-trained pilots and crews began to take their part in the fight for Britain.

Vast schemes of this kind, aiming at a large supply of trained officers and men, are not brought up to full working efficiency overnight. The same remarks apply to Empire aircraft production, and the orders placed in America for all kinds of aircraft to implement our own national production; but both these great schemes have one thing in common—it may well be a decisive factor for victory.

They are being developed in places which, whatever the scale of the attacks on Britain, are very unlikely to be open to enemy attack. They guarantee for the future a huge reservoir of aircraft and crews, built and trained under peaceful conditions which will never be available to the enemy.

The Collapse of France

With the collapse of France and the entry of Italy into the war there came a lull. It took Germany longer perhaps than she had anticipated to mount her attacks against this country. Not only did our bomber forces seriously interfere with the enemy's petrol supplies, communications and aircraft factories, but the necessary repairs to roads, bridges and other aids to conducting a large-scale air attack on England, had been broken down during the overrunning of France.

So the first raids over England, by day and by night, were, as Goering himself said, only armed reconnaissances. Germany has never placed much reliance in night bombing, and her pilots and crews are not taught the high level of efficiency and precision in navigation which is a feature of R.A.F. training.

Thus, while the German bombers were often unable to locate their targets (and even when they had done so to hit them), the R.A.F. continued night after night to pound the enemy, pursuing an ordered campaign to reduce the war potential and striking power.

Gradually, during the last two months, the German Air Force has overcome some of its difficulties, and is now in the process of mounting an increasing scale of operations against this country. It is probable that this attack has not yet reached its peak.

Day and night raids involving large numbers of enemy aircraft will, no doubt, be maintained. By day these attacks have already proved very costly to the enemy, and it is probable that night attacks (which he affects so much to despise) will be increased as time goes on.

Night interception presents many problems, but, with the able assistance of the searchlight crews, the Observer Corps and the anti-aircraft batteries, the difficulties are being met with increasing success.

By day our fighters have proved more than equal to the enemy. Since June 18, when the first large-scale raids began, approximately 1,500 German aircraft have been certainly destroyed, and probably a further 50 per cent. of this figure will never fly again.

Our own losses are, of course, considerable, but the

(*Concluded on page 211.*)

CORRESPONDENCE

The Editor does not hold himself responsible for the views expressed by correspondents. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

DISTINGUISHING NOISE

Peculiar Sound of German Raiders

AS a regular reader of your journal "*Flight*," I would like to ask you to settle a disagreement as to whether there is any distinguishing sound between German and British aircraft.

If there is a distinction, is this due to any such reason as the height at which they fly over this country, or to the silencing system of exhaust?

Believing as I do that I.C. engines have the same principle of design, and that aero engines have no exhaust silencing systems, it doesn't seem feasible that there can be a great difference in sound of different aero engines (of course grouping radials and in-line engines) of different countries, naturally barring the diesel engine out of this argument.

Colchester. H. C. JACKSON.

TRAVELLING SNACK BARS

Comfort in the Shelters.

WHILE lying full length last night on the very firm but as yet not very cold concrete floor of a public air-raid shelter, my mind was free to roam over many things and it at last came to rest on the creature comforts. Six hours did we put in in that very welcome refuge, listening to the occasional thuds and thumps outside, and the prospect of something hot to drink and a sandwich to eat was very tantalising. Why not establish a service whereby the "shelterees" could be supplied with a cup of tea or coffee and maybe buns, biscuits or anything else?

Each public shelter could be so served by travelling pie carts which could tour, each its own district, stopping at a shelter just long enough to supply those who wanted something. Over a long warning and particularly during the coming winter, most of the inhabitants of the catacombs would be cheered by a little internal warmth. I suggest that the job be left to private enterprise and not be done by a Ministry of Pie Carting. I am sure that this service to the community would be well rewarded, even though quite low rates were charged; in fact, I would take it on myself if not otherwise tied up.

Might I suggest to the authorities that they provide boards to sleep on instead of forms. You can't fall off a board, and besides, it is less expensive in timber.

MOTHER OF TEN.

ASSISTED TAKE-OFF

Limitations of Existing Proposals

THE interest in assisted take-off that has been shown in your columns recently is most encouraging. The use of high wing loadings is the only possible way of making any major improvement in aircraft efficiency, and the sooner it is generally appreciated the sooner the war will be won.

Fowler flaps and similar devices carried on the aircraft itself enable loadings of up to 40 lb./sq. ft., but to attain the ideal mentioned by Dr. Lanchester, of a loading such that at cruising speed the induced drag equals the profile drag, we need loadings of up to 75 and 80 lb./sq. ft., which means stalling speeds of 140-150 m.p.h., and some external form of assisted take-off is obviously necessary.

The idea of carrying a flying boat on a sort of hydroplane, as suggested by Mr. King, is obviously inadequate as the world's motor boat speed record is still some 50 m.p.h. below the stalling speed of our aeroplane, and it seems doubtful whether his contrivance could reach even the 100 m.p.h. take-off speed of the normal big flying boat.

Catapults, cables, sloping run-ways and other similar methods are all either impossible or impossibly dangerous for take-off speeds approaching 200 m.p.h., and leave the aircraft just above the ground and just above its stalling speed. Take-off at such speeds is bound to be dangerous whatever the method of acceleration, so that the only practical methods are those such as Flight Re-fuelling and the Mayo Composite, which temporarily reduce the loading, and consequently the speed, for take-off.

Unfortunately, Flight Re-fuelling can change the loading only by the amount of fuel required, which limits its loading possibilities, even on the longest journeys, to about 50 lb./sq. ft. Major Mayo's method has proved itself safe and practical, but it is too expensive and complicated for quantity production, and is limited to comparatively small aircraft.

To be satisfactory, the method of assistance must:—

(1) Reduce take-off run and speed to normal standards.

(2) Keep on assisting until a safe operating height is reached

(3) Make possible wing loadings of up to 80 lb./sq. ft. without restriction on the size of the aircraft.

(4) Be sufficiently simple for quantity production.

(5) Enable large numbers of aircraft to set off together.

To my knowledge there exists only one method which fulfils all these conditions, and that is now under development, but must remain secret. If successful, it will enable aircraft with the wing area and speed of the "Spitfire" to carry up to 5,000 lb. of bombs for 3,000 miles, whilst the bomb loads of really big types could go up from 5,000 to more than 30,000 lb.

Manchester. C. R. TENNANT.

INTERCEPTION AT NIGHT

Why Not Flying Searchlights?

THE problem of interception of enemy bombers during hours of darkness has been raised in many daily papers since night raids began over here. Appended is a suggestion from a layman.

Why not equip light or even heavy bombers with searchlights, using bomb load capacity for storage battery and generator. The generator could surely be driven by the engines. The bombers would patrol with fighters, working together in pairs preferably. Very heavily armed fighter or fighter-bombers would be required to make certain of destruction of enemy. Once the mobile searchlight obtained contact the fighter could attack from the best angle almost with impunity. Evasive action by the enemy would be quite difficult. These tactics could be employed over the less populated or less important areas behind the coast thus avoiding chance lighting of important places on ground.

I do not know if this has been attempted by either side as yet, but think it worth trying, if only as an experiment with our own machines.

If impracticable, it would give us ideas to counter any German use of the same tactics against our own bombers over there.

The suggestion is, of course, only an outline, but it seems one logical approach to the subject. If half-a-dozen were brought down nightly the effect would be encouraging, and wouldn't the Press give the R.A.F. a boost in America?

I realise, of course, that the weight factor is a bad snag, but not an impossible one. G. A. SIMMONDS.

Blackwood, Mon.

A YEAR OF WARFARE (Concluded from page 210).

present ratio is well in our favour, and, since we are fighting over England, the lives of many pilots are saved even when their aircraft are lost.

Survey of the first year of the air war must have an indefinite conclusion. Everything that has happened proves the superiority of the R.A.F. crews and aircraft. By weight of numbers the enemy is attempting to break down our fighter defence and to cripple our industry. On his failure to do this the whole course of the war may turn.

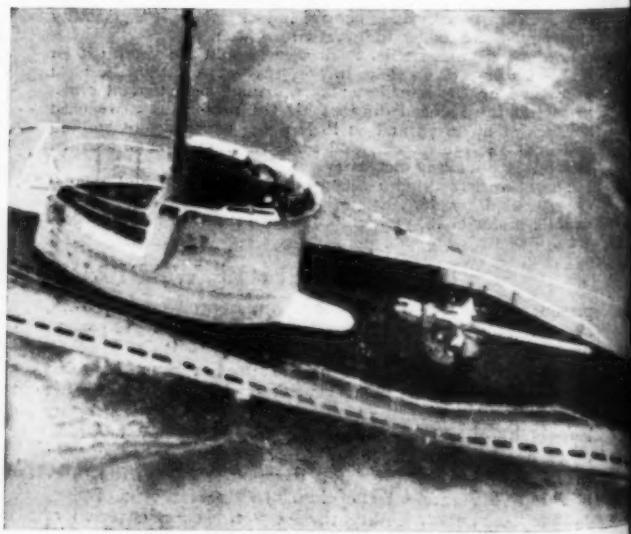
The R.A.F. are, at the close of this first year, full of confidence in their ability to smash the enemy, proud of their record—whether it be the steady night bombing over Germany or in the more spectacular combat against enemy bombers and fighters. They look forward during the coming winter to great increases in aircraft strength from factories at home and abroad, to the ever-growing stream of Dominion-trained personnel, the combination of which will establish definite air superiority, not only locally wherever the enemy is encountered, as it is at present, but over the whole battle areas.

With the R.A.F. supreme in the skies and the Navy invincible by sea there can be no doubt about victory.

R.A.F. WAR PHOTOGRAPHS

A Selection of the Pictures on Show at the Grafton Galleries

TOP left is "Nature's Camouflage," a winter scene in France of a Fairey Battle. Centre left is called "Alarm," showing Hurricane pilots running to their machines while, beneath that, is "W.A.A.F.S.," a picture of typical personnel of the Women's Auxiliary Air Force.



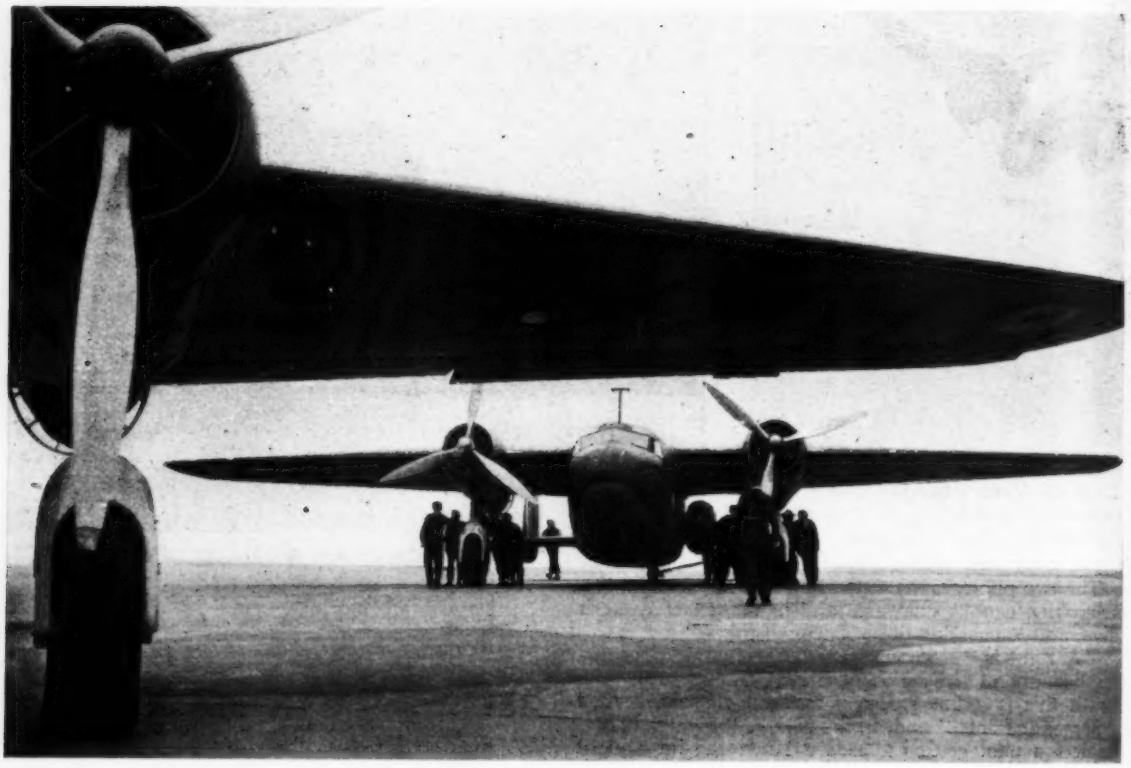
The Duke of Kent admiring a big enlargement of a *Flight* photograph of a Handley-Page Hampden.

The two photographs at the bottom are "U-Boat," a submarine caught unawares and in the act of a crash dive, and "The End of an Enemy Tanker."

Top right is "Reconnaissance over Dunkirk," showing burning oil and a Lockheed Hudson on patrol. Beneath this is a fine study of cheerful efficiency called "Sergeant Pilots," and, in the corner, "Fighter Pilot" depicts a pilot getting aboard a Hurricane for a night interception.

Originally intended to be open for six weeks, it is possible that this exhibition will become a permanent war feature.

SERVICE AVIATION



ON PARADE. R.A.F. mechanics bringing De Havilland Flamingos on to the tarmac.

Royal Air Force Awards and Official Announcements

Royalty at Fighter Command

ON Friday last Their Majesties the King and Queen visited the headquarters of Fighter Command. They were received by Air Chief Marshal Sir Hugh Dowding, Air Officer Commanding-in-Chief Fighter Command, and were able to watch the progress of an air battle.

King's Message to Polish Forces

IN acknowledging a telegram from the President of the Polish Republic, M. Raczkiewicz, on the first anniversary of Britain's entry into the war, the King sent the following message:—

"I and my peoples in this country and overseas are filled with admiration for the courage and tenacity of the Polish people. We are proud to have at our side in the defence of these islands the heroic Polish Army, Air Force, and Navy, which have covered themselves with glory during the last twelve months. The stirring feats of Polish aviators in the air battles now proceeding over England are bringing new honour to Polish arms.

"I share your Excellency's conviction in the final defeat of the tyranny now menacing Europe, and I look with confidence to the restoration of Polish independence and of the liberties of Europe."

Lord Nuffield's Gift

THE R.A.F. Benevolent Fund has benefited to the extent of £250,000 by the generosity of Lord Nuffield, who, with this sum, has founded the "Nuffield Endowment." The interest from this money will be applied to the relief of all forms of distress among dependants of R.A.F. personnel killed or incapacitated as a result of wounds or injuries received in action.

Flying Training Inspection

GROUP CAPTAIN THE DUKE OF KENT recently visited an elementary flying training school, where he saw bomber and fighter pilots undergoing their flying training. The commanding officer of the station showed the Duke over the aerodrome buildings and the lecture rooms, where classes of pupils were being taught navigation and instructed in armament. A number were studying enemy aircraft and ship recognition.

He concluded his tour by visiting a new recreational centre for the pupils, generously provided by a local resident, where facilities will be available during the winter months for indoor games, dancing and concerts.

U.S. Aircraft Types

IN addition to the Lockheed Hudsons and North American Harvards which have been operating in the R.A.F. for some while, there are six more American types already in this country. These are the Brewster Buffalo, Curtiss Hawk 75 c (as used by the French Air Force), Curtiss Helldiver, Douglas Boston, Martin 167 and Northrop 17.

Six further types on order are Bell Airacobra, Consolidated B-24, Lockheed P38, Curtiss P40, Grumman G36 and Consolidated 28. One of the latter was delivered as an experimental type some while ago.

Maltese Appreciation

A RESOLUTION passed by the Council of Government in Malta reads:

"Resolved that this House desires to place on record its high appreciation of the magnificent work performed by the Navy, Army and Royal Air Force in the defence of this outpost of the British Empire and to express its condolences with the next of kin of the members of the Allied Forces and of the civil population who have lost their lives in the great struggle for the freedom of the world."

Rates of Exchange

THE official rates of exchange for the periods shown have been fixed at:—Iceland, 5 krónur to equal 3s. 10d. (August); Sweden—currency advanced to British prisoners-of-war—5 kroner to equal 5s. 11d. (July and August) and Maria Theresa dollars, 1 dollar to equal 1s. 7¾d. (June, July and August).

Jewish Holy Days

SO far as exigencies of the service permit, and facilities exist, leave will be granted to R.A.F. personnel of the Jewish faith who wish to observe the festival of the New Year, which commences at sunset on October 2 and ends at sunset on October 4. Leave may also be given for the Festival of the Day of Atonement, which occurs between sunset October 11 and sunset October 12. Such leave, however, will not be extra to ordinary entitlement.

Two-War Pilot

SQN. LDR. STRANGE, who has been invested with a Bar to his D.F.C., is one of the very few old-timers still flying to-day. A pilot before the 1914-18 war (his certificate is No. 575), he rose to the rank of Lt.-Col. in the Royal Flying Corps, and was awarded the D.F.C.

Most of the intervening time between the two wars he spent in the aviation industry, and he was on the Whitney Straight board. When hostilities recommenced Sqn. Ldr. Strange accepted a commission as a Pilot Officer in the R.A.F.

While still holding this rank he was detailed to proceed from Hendon to Merville to act as ground control officer during the arrival and departure of various aircraft carrying food supplies. He displayed great skill and determination whilst under heavy bombing attacks and machine gun fire at Merville, where he was responsible for the repair and successful despatch of two aircraft to England. In the last remaining aircraft which was repaired under his supervision, he returned to Hendon in spite of being repeatedly attacked by Messerschmitts until well out to sea. He had no guns in action and had never flown this type of aircraft previously, but his brilliant piloting enabled him to return. It was for this devotion to duty that he received his further decoration.

SERVICE AVIATION (CONTINUED)

Awards

THE KING has been graciously pleased to approve the undermentioned awards, in recognition of gallantry displayed in flying operations against the enemy:—

BAR TO THE DISTINGUISHED FLYING CROSS.

A/Sqn. Ldr. P. W. Townsend, D.F.C. In July, 1940, whilst leading a section of a squadron to protect a convoy, this officer intercepted about twenty or thirty enemy aircraft, destroying one and severely damaging two others. The enemy formation was forced to withdraw. Under his command, the squadron has destroyed eight enemy aircraft while protecting convoys against sporadic enemy attacks. In August, 1940, his squadron, attacked some 250 enemy aircraft in the Thames Estuary. He, himself, shot down three enemy aircraft, the squadron as whole destroying at least ten and damaging many others. The success which has been achieved has been due to Sqn. Ldr. Townsend's unflagging zeal and leadership.

A/Flt. Lt. S. D. P. Connors, D.F.C., since killed in action. This officer has led his flight in all its operations against enemy with great skill and courage. In a week of almost continuous action he shot down at least four enemy aircraft, bringing his total successes to twelve.

A/Flt. Lt. A. C. Deere, D.F.C. Since the outbreak of war this officer has personally destroyed eleven and probably one other enemy aircraft and assisted in the destruction of two more. In addition to the skill and gallantry he has shown in leading his flight, and in many instances his squadron, Flt. Lt. Deere has displayed conspicuous bravery and determination in pressing home his attacks against superior numbers of enemy aircraft, often pursuing them across the Channel in order to shoot them down. As a leader he shows outstanding dash and determination.

DISTINGUISHED FLYING CROSS.

Sqn. Ldr. J. V. C. Badger. This officer assumed command of a squadron in July, 1940, and it is through his personal leadership that the squadron has achieved so many successes since the intensive air operations began. He has been instrumental in destroying six enemy aircraft. In spite of the fact that on three occasions he has returned with his aircraft very badly damaged through enemy cannon fire, he has immediately taken off in another aircraft to lead his squadron on patrol. Sqn. Ldr. Badger has displayed great courage and resolution.

Sqn. Ldr. A. R. D. MacDonell. This officer has shot down nine enemy aircraft and damaged four others. He has been particularly successful as a leader and has displayed the highest courage, setting a splendid example to his squadron.

Sqn Ldr. J. M. Thompson. This officer has commanded a squadron since January, 1940, and has operated over various areas in Northern France. He has taken part in nearly every patrol and, under his leadership, eighty-one enemy aircraft have been destroyed, twelve probably destroyed and at least forty-four damaged. He has, himself, shot down eight and damaged at least six enemy aircraft.

Flt. Lt. T. F. D. Morgan. This officer has shown great resolution as a fighter pilot and has led his flight, and at times his squadron, with conspicuous success. He has displayed great courage and determination in the face of heavy enemy odds, and has destroyed seven enemy aircraft. His behaviour in action has been an inspiration to the pilots in his flight.

P/O. J. A. Walker. This officer has shown himself to be a keen and steady pilot and has displayed magnificent courage in the face of superior numbers of enemy aircraft. Since the middle of May he has shot down at least six enemy aircraft.

P/O C. A. Woods-Scawen. This officer has taken part in all engagements carried out by his squadron since the commencement of hostilities. He has destroyed a total of six enemy aircraft, and severely damaged several others. In June, 1940, P/O. Woods-Scawen was shot down, landing some 25 miles within French territory, but succeeded in making his way back to his squadron. In spite of the fact that this pilot has been shot down six times, he has continued to fight with unabated courage and enthusiasm, and has shown outstanding qualities as a resourceful and determined leader.

Flt. Lt. A. A. McKellar, A.A.F. This officer has at all times displayed the keenest desire to engage the enemy. In his first large-scale encounter against enemy aircraft he displayed a great sense of leadership and tactics in launching his flight against ninety Heinkel 111s. As a result, at least four enemy aircraft were destroyed, of which Flt. Lt. McKellar destroyed three. He has displayed outstanding leadership and courage.

Act. Flt. Lt. P. M. Brothers. During an offensive patrol in August, this officer's flight encountered about one hundred enemy aircraft. He led the flight in an attack against them, but before this could be pressed home, he was himself attacked by a number of Messerschmitt 110s. Turning to meet them, he found himself in a stalled position; he spun out of it and immediately sighted and engaged a Dornier 215 which he shot down. Later in the day he destroyed a Messerschmitt 109. Altogether Flt. Lt. Brothers has destroyed seven enemy aircraft. He has at all times displayed great courage and initiative.

Act. Flt. Lt. S. R. Gibbs. In August, 1940, Flt. Lt. Gibbs, as captain of a Sunderland aircraft, was detailed to carry out a reconnaissance of Tromso. After a long night flight, under bad conditions, he located eight Heinkel 115 float planes, which he promptly attacked. As a result, three of these aircraft were destroyed and the remainder seriously damaged. Flt. Lt. Gibbs brought his aircraft safely to his home base after being in the air for fifteen and a half hours. Valuable information concerning shipping in the Tromso area was obtained. This officer has carried out over six hundred operational hours' flying since the commencement of hostilities. His excellent reconnaissance work includes the locating of survivors of the Andania and guiding a destroyer to the rescue. His perseverance and unflinching devotion to duty have proved invaluable.

F/O. G. N. S. Cleaver, A.A.F. This officer has been engaged in operational flying since December, 1939. He participated in numerous offensive patrols during operations in France and the Dunkirk evacuation. F/O. Cleaver has now destroyed seven enemy aircraft and possibly another two. In August, 1940, whilst his base was being subjected to intense bombing, he led his section with great determination and courage and, after destroying one of the attacking aircraft, he was severely wounded in both eyes. Desnite this, he refused to abandon his aircraft and effected a successful landing. He has displayed great determination and devotion to duty.

BAR TO THE DISTINGUISHED FLYING MEDAL.

Sgt. H. J. L. Hallowes, D.F.M. Since the commencement of hostilities this airman has personally destroyed twenty-one enemy aircraft. He has set a fine example of bravery and resolute bearing on many occasions.

DISTINGUISHED FLYING MEDAL.

Sgt. R. F. Hamlyn. In August, 1940, whilst on an offensive patrol, Sgt. Hamlyn attacked and destroyed one Junkers 88, and one Messerschmitt 109. A few hours later he engaged a Messerschmitt 109, chased it across the English Channel, and finally shot it down over Calais where it crashed in flames. Shortly afterwards he attacked and destroyed two further enemy aircraft, thus making a total of five in one day. Altogether this airman pilot has personally destroyed at least seven enemy aircraft. He has displayed great courage and good marksmanship.

Flt. Sgt. B. J. Thomas. This airman is serving with the Middle East Command.

Sgt. J. T. Craig. Sgt. Craig has been in action with his squadron almost continuously since May, 1940. During this period he has personally destroyed at least eight enemy aircraft. His magnificent spirit has been of a high order, and he has ably upheld the fine work of his squadron.

Sgt. W. L. Dymond. Since May, 1940, this airman pilot has accompanied his squadron on nearly all offensive patrols over France, and its engagements over this country. During this period he has shot down eight enemy aircraft, and probably destroyed a further three. Sgt. Dymond has displayed a fine fighting spirit.

Sgt. H. J. L. Hallowes. During June, 1940, Sgt. Hallowes was attacking an enemy aircraft over Northern France, when he himself was attacked. His engine being disabled, he proceeded to glide back to friendly territory but was again attacked when about to abandon his aircraft by parachute. He dropped back into his seat and as the enemy aircraft passed he delivered such an effective burst of fire as to destroy his opponent. He then made a successful parachute landing.

SQN. LDR. L. STRANGE leaving Buckingham Palace after being invested with a bar to his D.F.C. by H.M. The King.

London Gazette

Royal Navy

Acting Sub-Lieutenants (A) to be Sub-Lieutenants (A) with seniority as stated):—(March 14) H. A. Cheetham, L. G. Wheeler, P.E. Starmer; (July 8) J. J. R. Davies.

Temporary Sub-Lieutenant (A).—J. C. H. Kortright to be Temporary Lieutenant (A) (August 12); S. L. S. Head to be Temporary Sub-Lieutenant (A) (November 19, 1939).

Royal Air Force

General Duties Branch.

The undermentioned Flight Lieutenants are granted permanent commissions in the substantive rank of Flight Lieutenant:—(August 24) R. E. Burns, D.F.C.; (August 26) R. D. Welland.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Flight Sergeants: (April 1) G. A. Powell; (August 12, Sen. July 30) E. G. Couch, G. G. Petty. Temp. Flight Sergeant: (August 5, Sen. July 30) W. D. Beddoe. Sergeants: (July 30, Sen. May 2) R. G. Woodcraft; August 10, Sen. July 30) G. Shorrock; (August 12, Sen. May 2) A. N. Spear; (August 12, Sen. July 30) L. C. Williams; (August 14) A. E. Hurrell.

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(April 12) D. C. Carleton; (April 15) H. B. Gilchrist; (May 31) A. T. N. Scoltock; (June 23) J. E. Marshall; (July 1) P. H. G. Mitchell; (July 24) J. K. Punshon; (August 7) M. Paddle; (August 8) J. A. Milne.

The undermentioned Flying Officers are promoted to the rank of Flight Lieutenant:—(June 28) R. Bickford, D.F.C.; (July 6) G. T. B. Clayton, D.F.C.; (July 21) J. P. S. Smyth, D.F.C.; (July 27) T. R. Thomas; (July 28) G. A. W. Saunders.

The undermentioned Pilot Officers are promoted to the rank of Flying Officer on the dates stated:—(June 6) B. W. McMillan; (June 25) W. D. W. Bird; (June 29) L. W. Davies, A. MacC. Stott; (July 6) W. S. Brown, R. W. Turnbull; (July 16) D. Redington; (July 17) D. G. Smallwood, K. H. O. Young; (July 26) T. G. Weymouth, J. G. Mann; (July 25) D. Jeremiah; (July 28) A. C. Deere, D.F.C.; (July 29) J. N. Kentish.

The undermentioned are transferred to the Technical Branch (April 24):—Wing Commander: O. R. Pigott. Squadron Leaders: A. Pyke, J. R. Maclachlan.

Flt. Lt. A. Flowerdew is transferred to the

WING COMMANDER E. C. T. EDWARDS, winner of the King's Cup Race in 1931, and an enthusiastic private owner, is missing.

SERVICE AVIATION (CONTINUED)

Reserve (Administrative and Special Duties Branch) and retained on the active list (August 24).

Sqn. Ldr. W. S. Reed ceases to be seconded for Special Duty (July 6).

The short service commissions of the undermentioned are terminated on cessation of duty:—(August 19) Act. P/O. on probation R. G. D. Mathews; (August 25) P/O. on probation G. D. Gray.

Technical Branch.

The undermentioned are granted commissions for the duration of hostilities as Flying Officers on probation:—Warrant Officers: (May 16, Sen. March 14) P. G. Coleman, A. C. Ward; (May 23, Sen. February 15) W. A. Hampshire; (May 30, Sen. February 15) W. G. Collins; (June 14, Sen. May 23) H. J. Bignell; (July 3, Sen. May 9) F. S. Farrow; (July 8, Sen. March 14) D. Moncur; (July 17, Sen. May 9) C. H. Dawson; (August 10, Sen. March 14) J. G. Davies; (August 5) W. G. Bates.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—Flight Sergeants: (June 1, Sen. May 16) A. S. Blake, A.F.M.; (June 10, Sen. May 30) E. L. Williams; (July 8, Sen. May 16) R. H. H. Pelling; (July 16, Sen. July 3) H. F. Stowell. Leading Aircraftman (August 15, Sen. July 31) A. G. Patterson.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—Flight Sergeants: (July 5, Sen. May 16) H. C. Evans; (August 14, Sen. June 20) T. F. Kyle.

The undermentioned Flying Officers on probation are confirmed in their appointments:—(June 12) W. M. Matthews, A. R. Clark; (June 19) A. Matthews, L. R. Ridley, A. Dunn; (June 23) H. G. H. Copeland, J. Edwards, H. G. G. Matthews; (July 3) A. J. Haskell; (July 12) A. R. Glading, R. Bibby, F. E. Pearce, A. L. Whittaker, L. W. Elsey, R. W. V. Hancock, W. B. Wilson, W. J. Macken; (July 27) G. Ded, R. S. Neil; (August 22) C. H. Lucas, P. S. V. Vallis, V. A. B. Dixon; (August 23) F. C. Steadman; (August 28) B. Crane, A.F.M.

Balloon Branch.

W/O. E. C. Bale is granted a commission for the duration of hostilities as Pilot Officer on probation (July 25, Sen. June 27).

Administrative and Special Duties Branch.

The undermentioned are granted commissions for the duration of hostilities in the ranks stated: Flying Officers on probation. Warrant Officers: (July 25, Sen. May 22) W. H. Canniford; (Aug. 9, Sen. July 15) R. F. Gilvary; (Aug. 12, Sen. July 22) J. M. Hunter; Aug. 12, Sen. July 24) E. C. Bartlett. Pilot Officers on probation.—Warrant Officers: (Aug. 6, Sen. July 31) D. McFarlane; (Aug. 9, Sen. July 12) D. A. Upton; (Aug. 19, Sen. Aug. 13) W. C. Ansell. Flight Sergeants: (May 26, Sen. May 2) R. Taylor; (Aug. 15, Sen. July 25) A. G. Pell; (Aug. 19, Sen. Aug. 5) A. G. Cooper; (Aug. 21, Sen. Aug. 13) P. J. Hooper. Sergeants: (July 30, Sen. July 3) W. A. H. Thomas; (Aug. 15, Sen. Aug. 5) A. L. Gillan.

The undermentioned Flying Officers on probation are confirmed in their appointments:—(July 24) L. Mant; (Aug 10) J. Digby, J. S. Lancaster.

Equipment Branch.

W/O. H. Parker is granted a commission for the duration of hostilities as Flying Officer on probation (July 1, Sen. May 2).

Flt. Sgt. W. J. E. Kenaelly is granted a commission for the duration of hostilities as Pilot Officer on probation (July 13, Sen. June 20).

The undermentioned Pilot Officers on probation are confirmed in their appointments:—(May 1) J. McCartney, H Quilliam.

The undermentioned Pilot Officers are promoted to the rank of Flying Officers:—(July 3) F. H. Kelly, J. W. C. N. Young, F. W. Lund, A. A. R. Burne, W. O. Hill, K. C. R. Smith; (July 31) P. O. Hudson, J. McCartney, J. Trotman; (Aug. 25) G. Davis, S. E. Groves, H. Quilliam, H. E. Rossiter, A. B. Thomas.

Accountant Branch.

W/O. F. B. Pestell is granted a commission for the duration of hostilities as Flying Officer on probation (June 17, Sen. June 6).

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation. Warrant Officers: (June 14, Sen. June 6) E. A. Jones; (Aug. 20, Sen. Aug. 7) S. Willcox. Flight Sergeant: (July 5, Sen. June 6) F. R. Helliwell. Sergeant: (July 13, Sen. June 6) T. McAllister.

Royal Air Force Reserve

Reserve of Air Force Officers.

General Duties Branch.

The undermentioned Flight Lieutenants are granted the rank of Squadron Leader:—(April 5) R. Wilson; (July 31) J. S. Wilkins.

Flt. Lt. J. N. Dalzell relinquishes his commission on cessation of duty (Aug. 4).

Royal Air Force Volunteer Reserve

General Duties Branch.

The undermentioned Southern Rhodesian Air Force Officers are granted commissions for the duration of hostilities in the ranks stated. Flight Lieutenants: (March 21) R. M. Marshall, J. A. Greenshields, C. H. Prince. Flying Officers: (March 21) K. Hensman, M. C. H. Barber, P. C. Fletcher.

The undermentioned are granted commissions for the duration of hostilities as Pilot Officers on probation:—(June 1) G. C. Turner; (Aug. 5) A. S. Cameron, C. W. Duffie; (Aug. 10) J. F. McKee; (Aug. 12) G. E. Ferguson, A. S. Gallimore, D. Keiller, J. S. Machin; (Aug. 14) J. K. Horsburgh; (Aug. 19) J. S. Andrews. Sergeants: (June 16) M. E. Staples; (July 13, Sen. July 11) M. Bywater; (July 20) A. H. Hull, A. C. W. Holland, E. S. Few; (July 21) R. T. Turton; (July 27, Sen. July 21) D. H. Gage, J. H. Rowden, B. M. Thompson; (July 27) A. K. Gatward, D. G. Gething, J. K. Hill, H. Shannon, D. McI. Gray, C. Merrick, P. Myers, G. R. Hay, M. Hubbard; (Aug. 10, Sen. Aug. 4) J. B. Allen, P. Flowers; (Aug. 10) D. C. L. Chidell, R. S. Radley, R. J. Roake, D. H. Skinner, N. E. Hancock, J. E. Johnson, J. B. Kendal, E. B. Lyons, A. E. Mepham, D. A. Stanley, H. R. Case, D. Custerson, J. S. Fifield, M. G. Geoghegan, P. S. James, R. H. McGowan, W. McRobbie, F. G. Malim, H. J. W. Meakin, P. D. Pool, R. H. Thomas, J. Wotherspoon, M. M. Barbour; (Aug. 17) O. N. Massey, J. V. Marshall, D. B. Ogilvie, A. J. M. Aldwinckle, R. C. Graves, D. S. Harrison. Leading Aircraftmen: (June 30) D. C. Wilde; (July 27) P. H. Telford; (July 28) E. R. Phillips, R. H. L. Cressy, P. F. McIntyre, R. A. Webb; (Aug. 11) J. Mackenzie, D. Martin, A. Price.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—(July 12) I. H. List; (July 26) B. J. Fyson, T. V. Welsh. Leading Aircraftman: (Aug. 12) C. D. Brown.

Act. P/O. on probation A. Lammer is graded as Pilot Officer on probation (May 4).

The undermentioned are transferred to the Administrative and Special Duties Branch:—Pilot Officers on probation: (August 26) G. C. Laws; (August 27) R. R. Millais. Acting Pilot Officer on probation: (August 24) H. I. Ratut, W. W. Stevens.

F/O. G. E. Lloyd relinquishes his commission on account of ill-health (August 30).

Erratum.

In the Gazette of July 2. *For* Act. P/O. on probation B. Green *read* Act. P/O. on probation B. W. P. Green.

Accountant Branch.

The undermentioned are granted commissions for the duration of hostilities as Acting Pilot Officers on probation:—(August 10) D. Barker, V. L. Barrow, D. G. Bee, D. G. Binney, J. Bland, J. C. Chandler, E. Driver, T. I. V. Evans, F. Evers-Swindell, J. Foster, J. E. Garrish, J. V. Hadow, A. J. Harris, C. F. N. Harrison, J. Hill, R. R. Hunt, K. F. James, W. Lock, A. A. Logan, C. Manson, A. L. Monkhouse, C. Mont, E. L. Morris, E. H. Newman, S. V. Pearce, L. C. Roberts, F. A. Ross, R. Salomonson, C. Sephton, F. Sharpe, G. W. Shearn, W. A. Stoker, G. E. Stone, C. R. Summers, A. J. Talbot, I. Turner, T. W. Tyrrell, T. S. Wallace, H. R. Weaver, W. B. Wood.

The undermentioned Acting Pilot Officers on probation are graded as Pilot Officers on probation:—(June 13) G. Wright; (June 29) G. D. Powers.

The notification in the Gazette of August 6 concerning the undermentioned Acting Pilot Officers on probation is cancelled:—J. M. Bailey, S. Beamont-Smith, H. Eason, R. W. Goodburn, J. F. Humphreys, G. A. Puzey.

Medical Branch.

The undermentioned are granted commissions for the duration of hostilities in the ranks stated:—Flight Lieutenants:—(August 6) V. G. Renowden, M.B., B.S. (Flt. Lt. Medical Branch R.A.A.F.R.); (August 13) H. V. Edwards, M.B., B.Ch., M.R.C.S., L.R.C.P.; D. H. G. Macquaide, M.D., M.R.C.P. Flying Officers: (August 6) P. M. Burton, M.B., B.S., M.R.C.S., L.R.C.P.; E. L. Ellis, M.R.C.S., L.R.C.P.; G. Herbert, M.B., B.S., M.R.C.S., L.R.C.P.; J. Hoadley, M.R.C.S., L.R.C.P.; F. E. Joules, M.B., B.S., M.R.C.S., L.R.C.P.; A. H. Knight, M.R.C.S., L.R.C.P.; G. C. Lee, M.R.C.S., L.R.C.P.; T. S. Nicol, M.B., B.S., L.M.S.S.A.; F. R. Philps, M.B., B.S., M.R.C.S., L.R.C.P.; R. G. Robinson, M.B., B.S., M.R.C.S., L.R.C.P.; N. A. Ross, M.B., Ch.B.; B. A. Stoll, M.R.C.S., L.R.C.P.; T. E. Whitby, M.B., Ch.B., M.R.C.S., L.R.C.P.; C. F. Wright, M.R.C.S., L.R.C.P.; (August 13) P. B. Brown, M.R.C.S., L.R.C.P.; P. S. Byrne, M.B., Ch.B.; C. D. Cormac, B.M., B.Ch., D.P.H.; W. L. James, M.R.C.S., L.R.C.P.; H. B Jones, M.R.C.S., L.R.C.P.; J. M. Jones, M.B., B.S., M.R.C.S., L.R.C.P.; T. H. Lawton, M.B., Ch.B., L.R.C.P. & S., L.R.F.P.S.; N. Livingstone, M.B., Ch.B.; C. D. L. Lycett, M.B., B.S., M.R.C.S., L.R.C.P.; R. J. H. McMahon, M.B., B.S., M.R.C.S., L.R.C.P.; R. Oddie, M.B., B.Ch., M.R.C.S., L.R.C.P.

Sqn. Ldr. N. P. Henderson resigns his commission (August 19).

Chaplains Branch.

The undermentioned are granted commissions for the duration of hostilities with the relative rank of Squadron Leader:—(July 26) The Rev. G. D. U. Reeves; (August 15) The Rev. R. O. Mossop.

Auxiliary Air Force

Balloon Branch.

F/O. R. A. Corbett relinquishes his commission on account of ill-health (August 31).

Equipment Branch.

P/O. B. H. Penfold is transferred to the Administrative and Special Duties Branch (August 18).

Women's Auxiliary Air Force

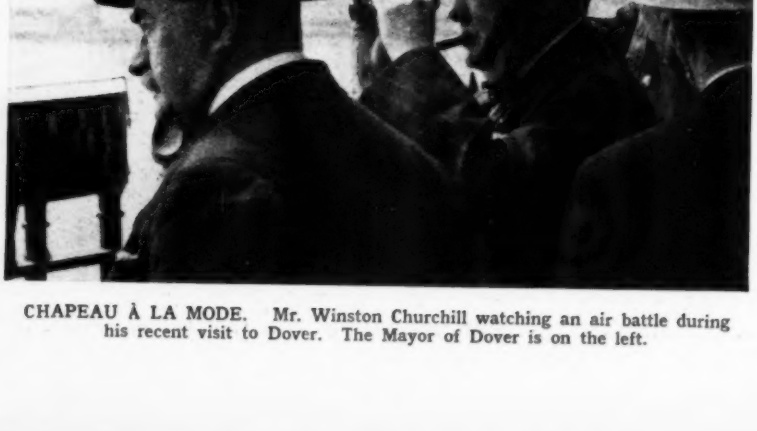
The undermentioned are appointed Assistant Section Officers on the dates stated:—(August 5) A/CW.2 Miss S. F. Ogle; (August 24) A/CW.1 Miss A. Ashton, A/CW.1 Miss J. A. G. Austin, Sgt. Miss J. D. A. Barnett, Sgt. Miss J. M. Carre, Cpl. Mrs. E. Claridge, A/CW.1 Miss C. A. Clapton-East, Sgt. Miss B. U. Darlow, A/CW.1 Miss J. L. Draper, Sen. Sgt. Miss C. M. H. Green, A/CW.1 Miss A. L. N. Hayne, A/CW.2 Mrs. E. Hill, Sgt. Miss R. E. Howard, A/CW.1 Miss B. M. Larkin, A/CW.1 Miss E. H. Lonsdale, Cpl. Miss M. R. Maude, Cpl. Miss L. E. Nicolsen, A/CW.1 Miss D. P. Seccombe, A/CW.1 Mrs. G. M. Shadbolt, Cpl. Miss D. Smart, A/CW.1 Miss E. J. Stevens, A/CW.1 Miss M. E. Symes, A/CW.1 Miss J. W. Thomas, A/CW.2 Miss F. M. Townson, A/CW.2 Miss M. T. Turner, A/CW.1 Miss D. M. Verdon-Smith, A/CW.1 Miss J. N. Williams, A/CW.1 Miss A. E. Wilson, Cpl. Miss P. M. S. Wink.

FL/O. Mrs. H. M. Johnson relinquishes her appointment (August 27).

The undermentioned Assistant Section Officers relinquish their appointments on account of ill-health:—(September 1) Miss F. G. McF. Pettet, Miss S. M. S. Romanes.

Erratum.

In the Gazette of August 13. Notification concerning A/CW.1 Miss M. I. Findley. *For* Findley *read* Findlay.



CHAPEAU À LA MODE. Mr. Winston Churchill watching an air battle during his recent visit to Dover. The Mayor of Dover is on the left.

HERE and THERE

More Lodestars

ADDING to its order of 16 Lockheed Lodestars which it placed last February, South African Airways have ordered another 13 of these twin-engined transports. All 29 will be powered with Pratt and Whitney Twin Wasps and Hamilton Standard Hydromatic airscrews. Also on order are two of the new four-engined Lockheed Excaliburs.

Flying Grandfather

CAPTAIN ERLON H. PARKER, who has flown more than one and a half million miles, and is now operations superintendent at La Guardia Field for Eastern Air Lines, is believed to be the only grandfather with a schedule air transport licence. He has four grandchildren. He started flying during the first World War and was with a naval aviation unit at Dunkerque on submarine patrol. In 1930 he piloted the inaugural flight for Eastern Air Transport, the predecessor for Eastern Air Lines.

Aeronca No. 1 for Museum

ELEVEN years after it was constructed, Aeronca No. 1 has "come home." Back to the Ohio factory of the Aeronautical Corporation of America has come this veteran, the factory's first product, now to go to the firm's museum in honourable retirement. Built in 1929, it was powered with an Aeronca 107 engine of 30 h.p. and still had the same one when it returned. Eleven years of flying is an achievement for any aeroplane, but for an "ultra-light" it is magnificent, and the Aeronca company—and all the pilots and ground engineers who handled the aeroplane during its life—deserve hearty congratulations.

U.S. Factories Expand

EACH month brings new figures for the personnel employed by the U.S. aircraft factories and they show that the big expansion is on the way. Of course, it is too early yet to expect to see the considerable increase in output of aircraft, but the greatly increased personnel will soon be evident from the accelerated flow which will emerge from the factory doors.

Since publishing the article "Expanding U.S. Production" on page 103 of the issue of August 8, the factories of the West Coast have taken on a total of 6,000 extra hands during June. The Douglas Company now employs approximately 18,000 (it was 15,700 in April) and has a backlog of orders of $140,000,000 ($97,000,000 in April). Lockheed has increased from 6,400 to 9,600 in personnel and its backlog from $55,000,000 to $169,000,000. North American, the General Motors subsidiary, has gone up in numbers from 5,025 to 6,000 and its backlog from $51,000,000 to $85,000,000.

Consolidated now employs 6,650 and has $71,000,000 backlog, while Boeing has a staff of 7,600 and an approximate backlog of $50,000,000. Vultee personnel numbers 3,300 with a backlog of nearly $15,000,000. Such expansion figures are impressive and it would not be surprising if the U.S. industry were manufacturing at the rate of 1,000 aeroplanes per month of all types by the end of this year.

"Flight" photograph.

FOR GENERAL SERVICE: Three De Havilland Flamingos and a D.H. Hertfordshire lined up on the tarmac. Most of the pilots were well known in airline and private flying circles in peace time.

High-speed Wind Tunnel

A HIGH-SPEED tunnel with a throat diameter of 20 feet and stated to be capable of reaching a wind speed of 400 m.p.h. is being constructed for the U.S. Army Air Corps at Wright Field, Ohio. It is primarily intended for applied research on new nacelles, cowlings, airscrews, fuselages and other components, but will also be able to take model aeroplanes up to a span of about 15 feet. It is not intended for fundamental research work.

The tunnel is arranged for closed or open throat testing and has a six-component balance overhead for model tests and a floor-type balance for full-scale tests on nacelles, airscrews and similar work. Drive will be by 40,000 h.p. electric motor weighing 249,000lb. through two 40ft. wind tunnel fans in tandem. The control room is air-conditioned and soundproofed and the model attitude may be changed by remote control without stopping the air stream.

Parachutists

THE Air Ministry points out that in the course of the present intensive air battles over this country our own fighter pilots have on several occasions landed by parachute, after baling out of damaged aircraft; and no doubt cases of this kind will occur again.

While there is continuing necessity for vigilance on the part of the public in general in regard to parachute landings, it is emphasised that only in the event of parachutists adopting a threatening attitude or attempting to commit hostile acts should force be used. Not only is there a chance of the isolated parachutist being a British fighter pilot, but he may well be one of our Polish, Czech, French or Belgian allies, who is unable to speak English at all. Once again, therefore, the public are asked to exercise great care and discretion.

If a parachutist is identified as an enemy or if his identity cannot be established at once, e.g., by production of his R.A.F. Identity Card, he should be made prisoner and handed over to the police or military authorities.

Records of Air-raid Damage

IT has come to the notice of the Air Ministry that various organisations, chiefly insurance and public utility companies and architectural engineering societies, are compiling and collating information about the damage caused by air raids on this country. It is pointed out that by so doing, perhaps unwittingly, these organisations are contravening a defence regulation. These records, in wrong hands, could be of considerable value to the enemy.

Any person or organisation wishing to compile information of this sort should first consult the appropriate Air Ministry Branch (A.I.1s.).

Why?

THE first landing by aeroplane on Henrietta Island was recently carried out by the Soviet pilot F. Yeremenko, accompanied by his mechanic, G. Sokolov, during a reconnaissance flight over the Laptev and East Siberian Seas. The island, part of the De Long Archipelago, is a small lone rock lost in a vast ocean of drifting ice. The surface of it is covered by a dome of ice 1½-2 miles across.

The landing was made during a strong side-wind between two cliffs on the dome, about 500ft. above sea level. The absence of open approaches, and the presence of pieces of rock everywhere made manœuvring difficult. The pilot and his mechanic spent over twelve hours on the island hunting for an open stretch, but without success, and finally were compelled to risk the take-off on a steep incline between two tall broken cliffs. The plane returned safely to its base at the Arctic station on Cape Chelyuskin.

THE INDUSTRY

Vickers Resignation

IT is announced that, in view of his many other interests, Mr. G. R. T. Taylor has resigned his seat on the Boards of Vickers Limited and English Steel Corporation Limited. He retains his directorship of Taylor Bros. & Co., Ltd., which company is a subsidiary of English Steel Corporation Limited.

The Nickel Bulletin

THE Nickel Bulletin for August contains an extensive abstract of a paper of American origin on nickel and nickel alloy thermocouples. Further, work, carried out in America, on precipitation-hardening of nickel and nickel-iron alloys is also abstracted at length.

An important paper recently issued gives data on the types of steel standardised by the Society of Automotive Engineers of America and on their British equivalents. Copies of this paper, The Nickel Bulletin, may be obtained, free of charge, from The Mond Nickel Company, Limited, 2, Upper Brighton Road, Surbiton, Surrey.

Tool Catalogue

A THIRTY-EIGHT page catalogue of their complete range of pneumatic and electric tools has been issued by the Consolidated Pneumatic Tool Co., Ltd.

The different types of tools, all with variations for specialised purposes, amounts to hundreds. Twelve pages, for instance, are devoted to various riveting and dimpling machines alone, and include both slow-hitting and fast-hitting types, single-impact types, close-quarters types, and a variety of pedestal-mounted tools.

The Consolidated Pneumatic Tool Co., Ltd., will send a copy of this publication upon receipt of a request from interested concerns. Applications should be addressed to 232, Dawes Road, London, S.W.6.

The Accumulator Manufacturers' Export Group

THIS Export Group was formed at the instance of the Export Council of the Board of Trade on May 16th last, the first step being a meeting of all interested parties on that day at the Board of Trade offices, under the chairmanship of Sir Clive Baillieu. As a result of the meeting a committee was elected, Mr. D. P. Dunne, managing director of The Chloride Electrical Storage Co., Ltd., being unanimously appointed chairman, and Mr. Edward Powell the secretary.

Almost every accumulator maker in the country is a member of the Group, and the following were elected to the committee: Mr. D. P. Dunne, chairman; Mr. F. J. Holmes, Hart Accumulator Co., Ltd.; Mr. W. H. Denby, The Chloride Electrical Storage Co., Ltd.; Mr. G. B. Page, Accumulators of Woking (1928), Ltd.; Mr. A. H. Shaw, Young Accumulator Co., Ltd.; Mr. Edward Powell, secretary.

The object of the Export Group is, in the main, to facilitate and expand the accumulator export trade. The Group, represented by the committee, working in close association with the Board of Trade and B.E.A.M.A., has already taken active steps in this direction, particular attention being paid to securing export business in those neutral countries which, before the war, were strongholds of the enemy, or of countries now occupied by the enemy.

Apart from the expansion of the export market itself, certain matters relating to the provision and distribution of raw materials, labour, and the like, come within the scope of the Group, as also do such subjects as the provision of freight and foreign currency.

The offices of the Group are at 27, Bedford Row, London, W.C.1. Tel. No.: Chancery 7221.

The Burning Question

THE National Fire Protection Co., Ltd., of Richmond, Surrey, claim for their National D.X. Powder and "494" cooling liquid, the perfect weapon in fighting burning metals, and this includes, of course, the incendiary bomb of the thermit magnesium type. While the thermit core is burning and supplying its own oxygen there is no known way of extinguishing the bomb, but in the secondary stage D.X. powder is effective.

It is necessary merely to cover the bomb with the powder and roll it over in a *small* area until it is thoroughly coated, when the flames will be extinguished. If the bomb is resting on a non-inflammable surface simply cover it with more power, but if on a wood floor, for instance, the heat may cause re-ignition. It is, therefore, necessary to remove the bomb, which may either be carried to a safe place in the shovel or immersed in the "494" liquid. This is delivered in a container having an oil-tight inner seal and a loose top cover.

Its use is not suggested in cases where large retorts have exploded, nor in factory fires where a large store of metal is kept, but a supply should be kept handy where machining and grinding of light alloys takes place.

"Instantair" Approved

AIR MINISTRY approval has now been given to the "Instantair" Coupling manufactured by B.E.N. Patents, of High Wycombe, Bucks. For some time this device has been largely used for groundwork in connection with the servicing of aircraft and operation of pneumatic tools, high-pressure boosters, etc., and it is now in process of standardisation throughout the Royal Air Force. The "Instantair" consists of a plug and socket, the latter incorporating an automatic non-return valve. Any item of compressed air operated equipment can be plugged in by a bayonet joint. The action of disconnecting the plug automatically closes the valve and shuts off the compressed air.

NEW COMPANIES

ANGLO-AMERICAN EQUIPMENTS LTD.—Registered as a private company on August 23, with a nominal capital of £1,000 in 2,000 "A" and 800 "B" shares of £1 each. Objects: To import from U.S.A., Canada and elsewhere all kinds of ammunition and parts for defence purposes, aeronautical parts, aeroplane engines, and anti-aircraft equipment and mechanical devices for defence purposes; to undertake contracts; to act as agents for American and British manufacturers and dealers; to arrange for production; to appoint agents and open offices in the U.S.A. and elsewhere. The directors are: Mechel Rabinowicz (of Polish nationality, Nationality of origin; Austrian), 75, Coleshill Street, Birmingham (director of Quick Supply, Ltd.); Mendel Springler, 97, Cazenove Road, N.16, clerk. Mechel Rabinowicz is permanent. Registered office: 75, Coleshill Street, Birmingham.

PUBLICATIONS RECEIVED

Engineering Workshop Manual, by E. Pull; 6s., Technical Press, Ltd., Ave Maria Lane, Ludgate Hill E.C.4.

Mechanical Testing of Metallic Materials, by R. A. Beaumont; 6s., Sir Isaac Pitman and Sons, Kingsway, London, W.C.2.

The Materials of Aircraft Construction, by F. T. Hill; 20s., Sir Isaac Pitman and Sons.

AERONAUTICAL AND PATENT SPECIFICATIONS

1938.

12844. ARMSTRONG, J. J. V. (Lambert, C. F.). Bombtails (521,787).

1929

10803. HORSLEY, E. C. Sighting apparatus for use on aircraft. April 8, 1929 (521,737).

11366. HORSLEY, E. C. Sighting apparatus for use on aircraft. April 12, 1929 (521,738).

1939

35515. HORSLEY, E. C. Bomb-sights and like navigation devices for use on aircraft. Nov. 26, 1939 (521,739).

1938.

(*Published August* 1, 1940.)

30253. GENERAL AIRCRAFT, LTD., and TEGERDINE, G. E. Clamping devices (522,940).

37012. TOMKINS, J. W. Variable-pitch propellers (522,949).

37295. STEVENS, A. H. (WRIGHT AERONAUTICAL CORPORATION). Mountings for vibratory bodies, such as engines (523,020).

37325. TECALEMIT, LTD. Lubrication of aero and other engines (523,031).

37366. MEISEL, P. Time fuzes for projectiles, and in particular aerial bombs (522,990).

37376. HENSCHEL FLUGZEUG-WERKE AKT.-GES. Rotary-wing aircraft (523,098).

37420. SALMOND, G. B. Means for de-icing surfaces of aircraft (523,108).

37448. RYBA, J., and HOLUB, J. Device for transmitting movements hydraulically, for use especially in connection with the fuel gauges of aircraft (523,117).

37522. BENDIX AVIATION CORPORATION. Electric lamp and socket structures (523,085).

27615. ATELIERS DE MECANIQUE INDUSTRIELLE. Apparatus for rotating two co-axially mounted screw propellers in opposite directions simultaneously (523,180).

37785. POLLAK, J. E. (See Fabriks Aktiebolag.) Welded steel pipe structures for aeroplanes (523,125).

1939.

22196. WRIGHT AERONAUTICAL CORPORATION. Mountings for vibratory bodies, such as engines (523,195).

27864. SPERRY GYROSCOPE CO., INC. Radio compass apparatus (523,093).

1938.

(*Published August* 8, 1940.)

27809. DE HAVILLAND AIRCRAFT CO., LTD., THOMAS, F. M., and HITCH, F. A. N. Rotary fluid-pressure machines (523,196).

35208. BRISTOL AEROPLANE CO., LTD., BUTLER, L. F. G., and CORDINER, W. Fluid-transmission joints (523,399).

37654. LAGABBE, E., DE. Heating of aircraft (523,206).

37713. PRECISION MODERNE. Correcting device for firing against movable objects (523,227).

37923 SCHURTER, W. Propulsion of aircraft (523,468).

37950. V.D.M. SPINNERS, LTD., MCGLASSON, R., and MARSHALL, F. G. Method of and means for preventing the formation of ice on aircraft (523,332).

1939.

13. RUDE, J. Propulsion of aircraft (523,357).

185. WAGNER, P. G. Power means for starting and recharging machine guns by retracting the breech bolt (523,371).

505. FAIREY AVIATION CO., LTD., LOBELLE, M. J. O., and GREENFIELD, W. W. Undercarriages for aircraft (523,439).

13043. WADDINGTON, E. Hydrovanes and landing floats (523,243).

18164. WORCESTER WINDSHIELDS AND CASEMENTS, LTD., and SOUTHALL, H. Radiators for aircraft engines (523,245).